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VOL. 41 — NO. 2 FEBRUARY, 1960 BARTOW, FLORIDA

Citrus Insect Control -- Spring 1960

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The first months of 1960 has passed with all major citrus pests at average to below average abundance. It is not likely that high populations will be common in February, but in early March we shall see sharp increases that will dictate the spring control effort.

Rust mite, which was numerous in some groves in January, will decline through March and then build up on new growth in April with a strong increase in May and June.

Citrus red mite, although at a low level in January, will increase rapidly in late February and March and quickly infest the new flush. The peak will occur in June. Texas Citrus mite and six-spotted mite will follow the same pattern of build-up, but are expected to be a problem in relatively few groves. If rainfall is below normal this spring, not only will populations of these spider mites be higher, but the damage due to their feeding will be accentuated.

Red scale usually is present in about half of the groves over the State in late winter. This year over 70 percent harbor this pest. Most of these are low populations. In general, infestations are expected to increase to a moderate level in the spring and to a high level later in the year. Purple scale populations are very low due to highly effective parasite activity in the past year. Our limited experience with this important new natural control factor indicates that populations of purple scale will be held to low levels this spring. Tangerine growers should keep in mind that chaff scale will be more abundant than usual throughout the spring season and may require control in the post-bloom period.

Aphids are an annual spring problem on new flush in young groves and in mature groves of Temples. Although mealybug is not expected to be troublesome in mature groves, growers should check their trees for this pest.

Melanose and scab were unusually prevalent last year due to abundant rains. The inoculum for these organisms was carried over in abundance, ready to infect new leaves and fruit whenever weather conditions are such that tender growth is continuously damp for periods longer than 36 hours.

SCALE AND MITE ACTIVITY BY DISTRICTS *

District	Purple Scale	Red Scale	Purple Mite	Rust Mite on leaves
West Coast	.47	3.39	1.00	2.63
Indian River	3.79	3.38	1.19	1.69
Upper East Coast	4.15	3.29	1.15	1.72
Gainesville	2.00	4.67	0	1.00
Orlando	2.38	1.46	.56	.64
Brooksville	.41	1.16	.37	1.27
Ridge	3.31	1.37	1.08	1.62
Bartow	4.30	3.67	1.75	2.13
State Average	2.94	2.96	.89	1.50
Last Year	2.86	3.46	1.35	1.48

*Second week in January. Activity is computed from populations, amount of hatching of scales, and number of groves with increasing or decreasing infestations. Activity is considered high if above 4.0 for purple scale, 3.0 for red scale, and 1.5 for mites.

SPRAY PROGRAM

A post-bloom spray is recommended for all varieties of Florida citrus. This application is essential for the control of melanose, scab and greasy spot and/or citrus rust mite; but materials for nutritional purposes and control of scale insects, spider mites and other pests may also be employed as needed.

The timing of the post-bloom spray is as important for maximum effectiveness as the selection of its ingredients and should be based as much as possible upon the problems to be solved. To determine when to spray or which grove to spray first, one should first assay the rust mite population. If rust mite is present on the foliage prior to or during bloom, the post-bloom spray should be applied when two-thirds of the petals have dropped or as soon as possible thereafter. On the other hand, if rust mite is not present, timing of the post-bloom spray depends upon whether disease control is desired. Copper sprays for scab and melanose should be applied when two-thirds of the petals have dropped, but the application should be delayed until one to three weeks after bloom for melanose alone. If copper is not applied and rust mite is not present, the application should be delayed until rust mite begins to appear or timed for other problems.

MELANOSE, SCAB AND GREASY SPOT CONTROL

It has long been known that copper compounds, especially copper sulfate and lime, increase scale insect and mite populations. In addition, copper reduces the value of zineb against rust mite. For these reasons copper sprays should be used only where disease control is essential or where nutritional needs cannot be handled through soil applications. The mixture of copper

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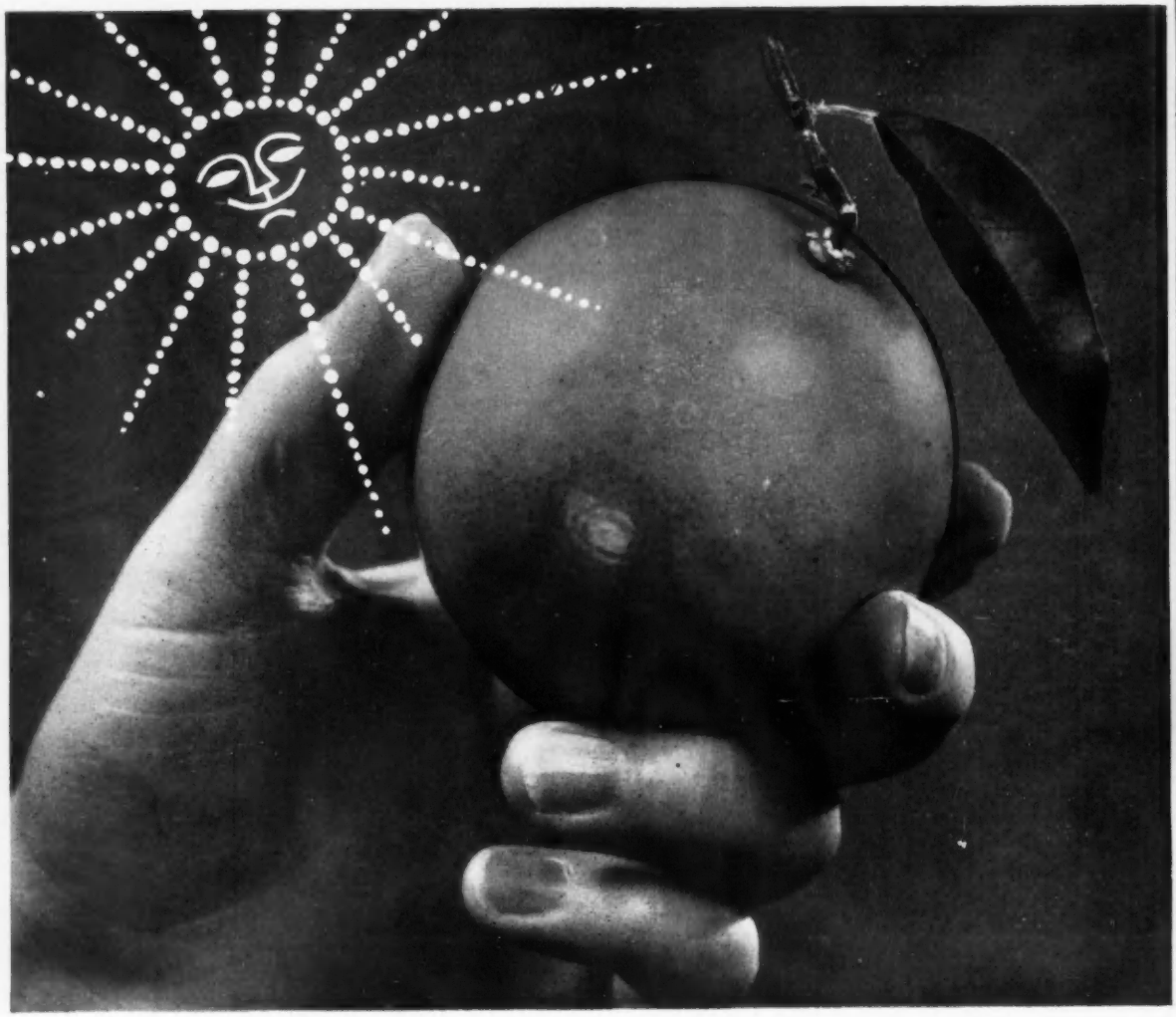
*Written January 21, 1960. Reports of surveys by Harold Holtsberg, Fort Pierce; J. W. Davis, Tavares; K. G. Townsend, Tampa; T. B. Hallam, Avon Park; and L. B. Anderson, Jr., Lake Alfred.



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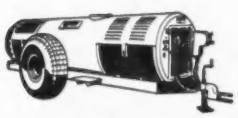

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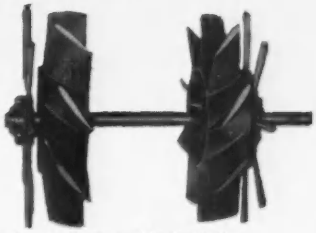

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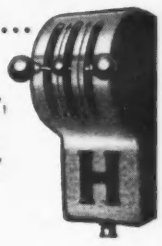

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CITRUS INSECT CONTROL—SPRING 1960

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sulfate and lime is not recommended.

Scab control is essential on rough lemon and sour orange nursery stock, Temple orange, tangelos and lemons. It is of less importance on grapefruit except in coastal areas where it is most severe. Scab may be controlled with two applications of copper, the first applied just after the start of the spring flush of growth and the second when two-thirds of the petals have dropped. Use enough neutral copper to supply 0.75 pound of metallic copper per 100 gallon. Scab may also be controlled with 1.5 pound of ferbam, but this material may not be used on fruit and must be confined to nursery stock or any non-bearing tree. Ferbam does not control melanose or greasy spot, but does give some control of rust mite.

The best control of melanose is obtained when copper is applied from one to three weeks after the petals have dropped. However, where large acreages are involved, where rust mite is also a problem or where scab must also be controlled, it is best to start applying copper as soon as two-thirds of the petals have dropped.

Greasy spot is most severe on lemons and grapefruit, but may be severe on any variety. The post-bloom melanose application of 0.75 pound of metallic copper per 100 gallon is important in greasy spot control. This application will control greasy spot on the spring flush of growth.

RUST MITE CONTROL

The longest period of rust mite control is obtained with all rust mite miticides when sprays wet all leaf and fruit surfaces and are applied before the population attains a high level. This is called preventive spraying and is the only way to obtain the longest control per dollar spent.

Rust mite may be adequately controlled from post-bloom until about the first part of July with one or two thorough preventive sprays. Zineb is the recommended rust mite miticide if control for the entire interval is to be obtained with one application. The success of this program depends not only upon a thorough application, but also on the selection of a proper dosage. There is very little difference in control between 0.5 and 1.0 pound of zineb per 100 gallon, but there is enough to be significant when post-bloom is early. If the post-bloom spray is applied in March or early April or if rust mite is numerous at the time of application, 1.0 pound of zineb should be used. On the other hand, 0.5 pound of zineb applied near the end of April or in May should last until July first.

All of the coppor compounds used on Florida citrus reduce the effectiveness of zineb, but this can be partially overcome by using the zineb at 1.0 pound rather than 0.5 pound. Although the higher dosage of zineb plus copper is significantly more effective than either wettable sulfur or 0.5 pound of zineb plus copper, it is not so good as 0.5 pound of zineb without copper. Nevertheless, zineb plus copper, if applied thoroughly when rust mite is absent or difficult to find, should last from the end of April until the first of July. Earlier applications or sprays applied where rust mite is numerous may have to be repeated.

Chlorobenzilate at 0.5 to 1.0 pound of wettable powder or 0.5 to 1.0 pint of the liquid formulation is the second best rust mite miticide while 5.0 pound of wettable sulfur is the third choice. Neither are effected by copper compounds, but will not last as long as zineb.

Trithion is about as effective as wettable sulfur and may be used at 0.5 pint or 1.0 pound where combined control of rust mite and spider mites is desired. It is not practical to use Trithion in the post-bloom spray for rust mite alone. This material, like sulfur, should not be expected to last from post-bloom until July unless supplemented with zineb.

BROAD MITE CONTROL

Broad mite occurs occasionally and causes an injury similar to the russet produced by rust mite. Except in the Homestead area where this mite was observed on small lemon and lime fruits in December, broad mite has been a spring problem on fruit about an inch or less in diameter. Broad mite has not occured on citrus every year and has been confined to groves on low land or adjoining wet areas. Groves in such areas as well as those with a history of broad mite injury should receive a post-bloom application of sulfur. Zineb does not control this mite.

SCALE INSECT AND MEALYBUG CONTROL

It will be unnecessary to include a scalicide in the post-bloom spray in most orange and grapefruit groves because of the low level of the average infestation of purple scale. Tangerines, however, should receive a scalicide to keep the fruit free of both purple and chaff scales which otherwise would cause grade-lowering green spots on the harvested fruit. Temples, especially those receiving copper, should also receive a scalicide. This application is good insurance against scale-induced fruit drop and green spots since copper sprays tend to increase scale insect populations.

A scalicide should be included in any grove where red scale is noticeable. This will assure a low population when the summer scalicide is applied. If red scale is kept at a low level throughout spring and summer, it should be unnecessary to apply a fall scalicide.

There are several scalicides and combinations that can be used. Each one has advantages and disadvantages. Parathion or malathion are both very effective, much safer than oil as far as the tree is concerned, and are recommended in preference to oil. They are not so likely to cause leaf drop or drop young fruit as oil and may be used with neutral compounds of zinc, copper, and manganese as well as borax, lead arsenate, and all miticides. Neither parathion nor malathion will control spider mites or rust mite. Use 0.15 to 0.25 pound of actual parathion per 100 gallon or 0.75 to 1.25 pound of actual malathion. Where fruit is present do not apply parathion within 14 days of harvest or malathion within 7 days of harvest.

Oil sprays containing 1.3% actual oil are effective scalicides that also control spider mites, but often cause severe leaf drop and drop of young fruit during dry weather or when there is a wind with low humidity. Neutral copper compounds may be used with oil, but some copper compounds may cause flocculation which results in fruit burn, leaf drop and poor disease control. Copper-oil sprays also increase the fall purple mite problem and are no longer recommended.

No more than one metallic compound should be used with oil emulsion except that lead arsenate may be added to copper-oil on grapefruit.

Two scalicide mixtures are also satisfactory for post-bloom use. These are: 0.7% actual oil with either 0.15 pound of actual parathion per 100 gallon or with 0.5 to 0.75 pound of actual malathion. The

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The Citrus Industry
EXCLUSIVE SPECIALIZED CITRUS PUBLICATION
Issued Monthly
Representative of every interest
Representing no special interest

Publication office at Bartow, Florida. Entered as second class matter February 16, 1920, at the post office at Tampa, Florida, under act of March 3, 1879. Entered as second class matter June 19, 1933, at the post office at Bartow, Florida, under act of March 3, 1879.

Comparison Of Some Characteristics Of ... Commercial Concentrated Frozen Orange Juices[1]

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Frozen concentrated orange juices (14) were obtained from citrus concentrate plants in Florida during five citrus seasons so that the chemical, physical, microbiological, and organoleptic characteristics of this product could be determined (2, 7, 9a, b, c, d, e). During the five seasons covered by this survey about 340 million gallons of frozen concentrated orange juice were produced in Florida. Some changes in commercial processing procedures were made during this period. Also varied seasonal conditions occurred, especially during the 1957-58 season when serious problems were encountered by the industry because of severe freezes which resulted in reduced concentrate production and attendant regulations of manufacture to insure quality.

The purposes of this paper are to (a) show differences which were found in certain characteristics of commercial samples from midseason and late season packs of frozen orange concentrate, (b) substantiate the apparent seasonal trends for some properties of frozen orange concentrate previously indicated in recent publications (2, 7), and (c) further establish the influence of modifications in processing on these characteristics. To accomplish these purposes, some of the data obtained from the examination of 1038 commercial samples packed during five citrus seasons have been summarized and are discussed in this paper. Characteristics which are compared include pulp content, water-insoluble solids, pectinesterase activity, water-soluble or serum pectin, and flavonoid content. Degrees of gelation and clarification were also determined initially and after storage of the samples for either 72 or 96 hours at 40°F. Considerable data pertaining to 10 other characteristics of these commercial samples of frozen concentrated orange juices have been obtained by persons, other than the authors, and previously reported (9a, b, c, d, e, 16).

EXPERIMENTAL PROCEDURE

Collection of Samples

With the assistance of personnel of the Agricultural Marketing Service, U.S.D.A., Winter Haven, Florida, samples of frozen orange concentrate were obtained from all of the commercial plants in Florida during the 1953-54, 1954-55, 1956-57, 1957-58 and 1958-59 citrus seasons. Samples were collected semimonthly throughout the processing period, which usually extended from December through June. The number of samples examined from each season's pack from over 20 plants varied from slightly under to slightly over 200.

Arrangements of Data in Tables 1-7

Data for seven characteristics of the frozen orange concentrate samples are presented in frequency distribution tables on a midseason and late season basis.

The last samples collected during the midseason for 1957-58 were obtained on February 15; for 1953-54 and 1954-55 on March 1; and for 1956-57 and 1958-59 on March 15. This break-point between midseason and late season was based on a marked change in the color of the concentrates indicated by the Hunter "a" values as determined with a Hunter Color Difference Meter (16). This change in color resulted from the use of Valencia oranges, the juice of which has a better orange color than that from

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[1] Cooperative research by the Florida Citrus Commission and Florida Citrus Experiment Station.

Florida Agricultural Experiment Station Journal Series, No. 968.

Presented at Florida State Horticultural Society Annual Meeting in Miami, 1959.

Comparison Of Some Characteristics Of . . . Commercial Concentrated Frozen Orange Juices[1]

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either early or midseason varieties of oranges.

EXPERIMENTAL RESULTS AND DISCUSSION

Pulp Content and Water-Insoluble Solids

The pulp content of the reconstituted juices (1 can of concentrate plus 3 cans of water) was measured as per cent by volume using the U.S.D.A. centrifugal method (15), except for the 1953-54 and 1954-55 seasons when the reconstituted juices were centrifuged for 15 minutes at 1700 revolutions per minute.

A comparison of the pulp content in reconstituted juices from samples of midseason and late season packs of commercial frozen orange concentrate may be made by examining the frequency distribution tables presented in Table 1. The percentages of both midseason and late season samples in the medium (8.5 to 11.4 per cent) and high (11.5 to more than 12.9 per cent) pulp ranges were greater during the last three than in the first two seasons, when most of the samples were in the low (4.5 to 8.4 per cent) pulp range. Thus, a major change in this characteristic of frozen orange concentrate occurred. The frequency table for the 1956-57 season indicates that the highest pulp levels during the five seasons occurred in products packed during this period. However, a decrease in pulp content in both midseason and late season samples was found during the last two seasons; this decrease was greater in the products collected during the late season. This trend is also evident from the average pulp values, which were calculated but not tabulated, for the midseason samples of 12.5 per cent by volume for 1956-57, 11.8 per cent for 1957-58, and 11.2 per cent for 1958-59 and values of 11.7, 10.4, and 9.9 per cent for the late season samples from the same periods. In the high pulp range of 11.5 to more than 12.9 per cent for the five seasons there appears to be about twice as many midseason as late season samples.

Water-insoluble solids, expressed as milligrams per 100 (mg/100 g) of reconstituted juice, were determined by a modified A.O.A.C. method (11).

The frequency distribution tables of water-insoluble solids in the reconstituted juices are presented in Table 2. In comparing the midseason and late season samples from four seasons there appears to be about the same per cent of each in both the low range of 75 to 124 mg/100 g and the medium range of 125 to 199 mg/100 g. In the high range of 200 to 349 mg/100 g there were more midseason than late season samples, but the difference was not large. Average values for water-insoluble solids in the midseason samples for the four seasons were 152, 179, 167, and 161 mg/100 g, respectively, beginning with the 1954-55 season; in the late seasen samples the average values were 141, 184, 162, and 165 mg/100 g. These average values, as well as the frequency distribution tables of water-insoluble solids, indicate trends in this characteristic over the four seasons similar to those found for the pulp content. The water-insoluble solids were markedly greater in both the midseason and late season samples from 1956-57 than those in the 1954-55 products. During 1957-58 the values definitely decreased in the samples from both the midseason and late season and then were about

Table 1. Comparison of frequency distribution tables of pulp in samples from midseason and late season packs of commercial frozen concentrated orange juices collected during five citrus seasons.

	Midseason					Late season				
	Number of samples and season					Number of samples and season				
Pulp by volume %	120	113	114	99	118	101	102	98	94	79
	1953-54[1]	1954-55[1]	1956-57[2]	1957-58[2]	1958-59[2]	1953-54[1]	1954-55[1]	1956-57[2]	1957-58[2]	1958-59[2]
	% of samples					% of samples				
4.5- 6.9	25.1	10.7	0.0	0.0	0.0	46.3	24.5	0.0	0.0	0.0
7.0- 7.4	9.9	25.3	0.0	0.0	0.0	9.8	29.3	0.0	0.0	1.2
7.5- 7.9	14.9	2.7	0.0	1.0	1.7	15.7	4.8	0.0	0.0	1.2
8.0- 8.4	17.5	22.1	0.9	0.0	2.5	16.8	15.8	1.1	1.0	6.5
8.5- 8.9	9.9	4.4	0.0	1.9	2.5	7.0	8.9	1.9	2.3	10.2
9.0- 9.4	5.9	8.0	0.9	5.1	7.7	3.9	8.9	8.2	19.1	12.7
9.5- 9.9	3.3	1.0	3.5	1.0	2.5	0.0	0.8	1.1	8.6	15.2
10.0-10.4	4.0	6.3	10.7	12.1	15.2	0.0	4.8	7.4	31.0	23.9
10.5-10.9	2.6	2.7	5.2	6.0	14.4	0.5	1.1	5.2	3.3	10.2
11.0-11.4	2.6	4.4	14.9	21.2	16.2	0.0	1.1	14.3	19.9	9.0
11.5-11.9	1.7	1.7	2.6	5.1	5.2	0.0	0.0	4.1	3.1	5.0
12.0-12.4	1.7	6.3	19.3	15.2	14.2	0.0	0.0	29.6	6.4	3.7
12.5-12.9	0.9	0.0	7.1	7.0	3.5	0.0	0.0	5.0	1.0	1.2
More than 12.9	0.0	4.4	34.9	24.4	14.4	0.0	0.0	22.1	4.3	0.0

[1]Centrifuged for 15 minutes at 1700 rpm (rcf = 657).
[2]Centrifuged for 10 minutes at 1300 rpm (rcf = 384).

Table 2. Comparison of frequency distribution tables of water-insoluble solids in samples from midseason and late season packs of commercial frozen concentrated orange juices collected during four citrus seasons.

Water insoluble-solids in reconstituted juice mg/100 g	Midseason				Late season			
	Number of samples and season				Number of samples and season			
	113	114	99	118	102	98	94	79
	1954-55	1956-57	1957-58	1958-59	1954-55	1956-57	1957-58	1958-59
	% of samples				% of samples			
75- 99	9.7	0.0	0.0	1.7	4.8	0.0	1.0	0.0
100-124	21.3	3.5	9.2	11.0	34.2	0.0	9.4	7.6
125-149	29.0	15.8	22.2	21.2	24.7	4.1	24.4	21.5
150-174	16.0	30.7	32.4	39.0	24.5	28.7	35.1	39.2
175-199	8.0	23.6	19.1	16.9	5.9	39.8	21.4	22.8
200-224	4.3	19.3	11.1	7.6	2.1	24.4	6.4	3.8
225-249	6.3	5.3	6.0	2.6	3.8	3.0	2.3	3.8
250-274	2.7	0.9	0.0	0.0	0.0	0.0	0.0	0.0
275-299	1.7	0.9	0.0	0.0	0.0	0.0	0.0	0.0
300-324	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3
325-349	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Table 3. Comparison of frequency distribution tables of pectinesterase activity in samples from midseason and late season packs of commercial frozen concentrated orange juices collected during five citrus seasons.

	Midseason					Late season				
	Number of samples and season					Number of samples and season				
Pectinesterase activity[1]	120	113	114	99	118	101	102	98	94	79
	1953-54	1954-55	1956-57	1957-58	1958-59	1953-54	1954-55	1956-57	1957-58	1958-59
	% of samples					% of samples				
0.0- 0.9	0.0	0.0	0.0	12.0	11.0	0.0	0.0	0.0	12.9	9.0
1.0- 1.9	0.0	0.0	8.0	40.3	42.4	0.0	0.8	5.0	31.0	53.1
2.0- 2.9	0.0	1.7	14.9	22.2	23.7	1.1	3.0	15.4	24.4	18.9
3.0- 3.9	4.2	4.4	23.6	15.2	10.2	3.1	9.9	25.5	8.4	1.3
4.0- 4.9	9.9	18.5	13.2	9.2	6.2	7.9	16.7	13.2	6.4	9.0
5.0- 5.9	10.0	10.7	9.7	0.0	3.3	7.9	14.8	7.1	7.5	2.5
6.0- 6.9	12.5	14.1	11.3	0.0	0.8	9.6	12.6	8.2	5.3	3.7
7.0- 7.9	9.9	8.0	6.1	0.0	0.0	15.8	4.8	5.0	2.1	1.3
8.0- 8.9	8.3	8.8	3.5	1.1	0.0	12.7	6.7	6.1	1.0	1.2
9.0 9.9	3.3	7.0	4.5	0.0	0.8	3.9	5.9	5.0	1.0	0.0
10.0-10.9	4.2	3.6	0.0	0.0	0.8	3.1	3.0	2.2	0.0	0.0
11.0-11.9	1.8	2.7	1.7	0.0	0.8	3.1	7.0	4.1	0.0	0.0
More than 11.9	35.9	20.5	3.5	0.0	0.0	31.8	14.8	3.2	0.0	0.0

[1]Pectinesterase activity measured as (PE,u.)g. soluble solids X 1000.

the same in the 1958-59 samples. The samples of orange concentrate had the largest amounts of water-insoluble solids during the 1956-57 season.

It is believed that the differences found between seasons in both the pulp content and the water-insoluble solids in the commercial samples of frozen orange concentrate were chiefly caused by changes in extraction and finishing procedures. Such changes were introduced primarily to obtain greater yields of juice because of the economic importance of this factor in the production of citrus concentrates. It is also of interest to note that during the 1957-58 season, when large quantities of freeze-damaged oranges were utilized and extraction and finishing procedures were altered to give lower yields of juice, that the pulp content and water-insoluble solids in the commercial samples markedly decreased.

Table 4. Comparison of frequency distribution tables of water soluble or serum pectin in samples from midseason and late season packs of commercial frozen concentrated orange juices collected during five citrus seasons.

Pectin in reconstituted juice mg/100 g	Midseason Number of samples and season 120	113	114	99	118	Late season Number of samples and season 101	102	98	94	79
	1953-54	1954-55	1956-57	1957-58	1958-59	1953-54	1954-55	1956-57	1957-58	1958-59
	% of samples					% of samples				
0-14	1.7	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0
15-19	4.2	0.0	0.0	0.0	0.0	3.1	1.1	0.0	0.0	0.0
20-24	7.6	1.6	0.0	0.0	0.0	10.9	6.7	0.0	0.0	0.0
25-29	18.4	12.4	0.0	0.0	0.0	29.8	26.3	0.0	6.4	1.3
30-34	19.2	27.4	10.6	4.1	5.9	31.5	17.7	8.0	8.4	3.8
35-39	20.6	24.0	14.9	24.2	6.8	13.8	32.4	48.2	41.5	22.8
40-44	13.3	16.5	39.4	38.4	18.7	7.8	9.9	12.3	22.3	32.9
45-49	7.6	12.4	21.0	21.2	30.5	1.1	4.8	27.7	17.0	29.1
50-54	5.7	5.3	8.8	9.0	18.6	0.0	1.1	1.9	2.3	6.3
55-59	1.7	1.0	3.5	3.1	9.3	0.0	0.0	1.9	2.1	3.8
60-64	0.0	0.0	0.9	0.0	8.5	0.0	0.0	0.0	0.0	0.0
65-69	0.0	0.0	0.9	0.0	1.7	0.0	0.0	0.0	0.0	0.0

Pectinesterase Activity and Water-Soluble Pectin

Pectinesterase is the pectic enzyme responsible for the breakdown of the water-soluble pectin in citrus juices. By inhibiting pectinesterase activity with heat treatment, the water-soluble pectin in citrus juices is protected from deesterification. In general, concentrates containing the same pectinesterase activity will retain their cloud during storage in proportion to the amount of water-soluble pectin present. The activity of this enzyme in the samples of frozen orange concentrate was determined by a previously published method (10) and units expressed as (PE.u.)g soluble solids, which represents the milliequivalents of ester hydrolyzed per minute per gram of soluble solids (° Brix) and multiplied by 1000 for easy interpretation.

Data obtained concerning the pectinesterase activity are presented in Table 3. Comparison of the midseason and late season samples for each of the five seasons shows that the same number of each were in the low range of 0.0 to 2.9, the medium range of 3.0 to 8.9, and the high range of 9.0 to more than 11.9 units. However, there was a definite decrease each year in the pectinesterase activity in both the midseason and late season concentrates as indicated by the frequency distribution tables. No midseason and only 1.1 per cent late season samples were present in the low range in 1953-54, whereas, the percentages of midseason and late season samples in the low range progressively increased until in 1958-59 they were 77.1 and 81.0 per cent, respectively. Beginning with the 1953-54 season the average pectinesterase values for the five seasons were 11.2, 8.1, 5.2, 2.8, and 2.4 units, respectively, for all of the concentrates. No differences in this characteristic were apparent between the midseason and late season samples.

The continuous decrease in the pectinesterase activity in the frozen orange concentrates during the five seasons was brought about by the gradual but progressive increase in the temperature and/or length of time for heat treatment of the raw or partially concentrated juices. Stabilization temperatures during this period ranged from about 155° to 195°F. Such treatment was necessary because increases which also occurred in larger amounts of pulp and water-insoluble solids, as previously discussed, together with other factors resulted in greater pectinesterase activity and more water-soluble pectin in the concentrates. These characteristics made possible stability problems if the products were abused by failure to store them at temperatures of 0°F. or below from the time they were produced until used by consumers.

Pectin in the centrifuged reconstituted juices (serums), expressed as milligrams per 100 grams (mg/100 g) of anhydrogalacturonic acid (AGA), was determined by a previously described method (10). Frequency distribution tables of water-soluble or serum pectin are given in Table 4. The percentage of midseason samples in the high pectin of 40 to 69 mg/100 g appears to be somewhat more than that of the late season samples for each of the five seasons, and especially for the 1956-57 and 1957-58 seasons when the differences between the midseason and late season samples in this high range were 30.7 per cent and 28.0 per cent, respectively. Average serum pectin in the midseason concentrates, beginning with the 1953-54 season were 38.2, 37.8, 43.3, 43.2, and 47.8 mg/100 g, respectively, and for the late season samples the average values were 37.6, 33.0, 39.4, 39.4, and 43.1 mg/100 g for the same periods. The highest levels of serum pectin occurred in the samples during the 1958-59 season. This may have partially resulted from the use of pulp washing pro-

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Table 5. Comparison of frequency distribution tables of cloud in samples from midseason and late season packs of commercial frozen concentrated orange juices collected during five citrus seasons.

Cloud as light transmittance[1] %	Midseason Number of samples and season 120	113	114	99	118	Late season Number of samples and season 101	102	98	94	79
	1953-54	1954-55	1956-57	1957-58	1958-59	1953-54	1954-55	1956-57	1957-58	1958-59
	% of samples					% of samples				
26.0-28.9	0.0	0.0	3.5	21.2	0.0	0.0	0.0	1.1	24.4	0.0
29.0-29.9	0.0	0.0	4.3	17.2	2.5	0.0	0.0	0.0	21.4	1.2
30.0-30.9	0.0	0.0	20.3	23.2	17.0	0.0	0.0	10.2	22.4	2.5
31.0-31.9	0.0	0.0	17.5	24.1	17.9	0.0	0.0	9.3	18.1	15.2
32.0-32.9	0.0	0.0	21.0	5.1	23.7	0.0	0.0	20.5	7.4	16.5
33.0-33.9	0.0	2.7	14.9	5.1	19.5	0.0	0.8	23.6	5.3	21.4
34.0-34.9	0.9	9.7	13.3	4.1	12.7	0.0	0.0	18.3	1.0	17.7
35.0-35.9	4.1	17.7	1.7	0.0	5.9	0.0	4.1	7.1	0.0	9.0
36.0-36.9	3.3	18.6	2.6	0.0	0.8	0.0	4.8	6.1	0.0	11.5
37.0-37.9	10.9	17.6	0.9	0.0	0.0	1.1	8.9	1.9	0.0	2.5
More than 37.9	80.8	33.7	0.0	0.0	0.0	98.9	81.4	1.9	0.0	2.5

[1]Cloud measured as percentage light transmittance of centrifuged reconstituted juice using Lumetron colorimeter, Model 402-E, filter No. 730 and 14 ml cell.

cedures during the production of frozen orange concentrate, since this season was the first during which the majority of the concentrate plants produced water extracts of orange pulp.

The frequency distribution tables in Table 4 indicate a continuous increase during the five seasons in the water-soluble or serum pectin of both the midseason and late season concentrates. It is possible that this increase in pectin was a result of the decrease in pectinesterase activity, as previously shown by the data in Table 3, since decreased activity could result in less of the water-soluble pectin initially in the extracted orange juice being converted to oxalate-soluble pectin during processing.

Initial Gelation and Clarification

The concentrates were graded for degree of gelation by visual examination (8). Degree of clarification was determined by measuring the percentage light transmittance of the centrifuged reconstituted juices using a Photovolt Lumetron colorimeter, Model No. 402-E, with 14 ml cell and filter No. 730 (1, 3, 6).

The concentrates were thawed and examined for initial degree of gelation. For the 1953-54 season no gelation was found initially in any of the samples. Very slight gelation occurred in midseason samples to the extent of 2.6, 8.8, 1.0, and 0.8 per cent, respectively, for the four seasons beginning with 1954-55; and 8.8, 0.0, 9.6, and 6.3 per cent of the late season samples showed very slight gelation during these same periods. Also, a slight degree of gelation was observed initially in 0.9, 0.9, 0.0, and 0.0 per cent of the midseason concentrates packed during these four seasons, while this same degree of gelation was noticed in 0.0, 1.0, 10.6, and 0.0 per cent, respectively, of the late season samples. The degree of gelation found initially in all of the samples from the five years was not considered to be of any importance to consumers. The largest percentages of late season concentrates which initially showed some gelation were in samples from 1957-58 when freeze-damaged fruit was extensively used.

Data obtained by examination of the centrifuged reconstituted juices for initial "cloud" are presented in frequency distribution tables in Table 5. The percentage light transmittance is a measurement of cloud. An increase in light transmittance is actually a decrease in cloud or turbidity. Less than one per cent of all of the concentrates from the five seasons, when reconstituted, showed initially definite or extreme degrees of cloud loss or clarification which are considered to be objectionable to consumers; these undesirable degrees of clarification are indicated by light transmittance values of 70 per cent or greater as indicated in footnote to Table 6.

It is seen from the frequency distribution tables that more initial cloud or turbidity was found in both the midseason and late season samples from the last three seasons than that which occurred in the samples from the first two seasons. This is chiefly due to the greater amounts of water-soluble or serum pectin in those samples obtained during the last three seasons, as is shown by the frequency tables for this characteristic in Table 4; also, other factors involved were the pulp content and water-insoluble solids, which were also greater in the concentrates from the last three seasons as is seen from the data in Tables 1 and 2.

The 1957-58 samples possessed the best cloud in all of the concentrates from the five seasons and this possibly resulted from the use of frozen fruit during this season since data previously reported (13) indicated that orange concentrate produced from freeze-damaged fruit contained large amounts of serum pectin and had very good turbidity or cloud.

Gelation and Clarification After Storage of Concentrates at 40°F.

A "stability test" based on the storage of the concentrates for 96 hours at 40°F. was chosen for the 1956-57, 1957-58 and 1958-59 samples as compared to 72 hours at 40°F. for the 1953-54 and 1954-55 samples. After storage under these conditions the degree of gelation in the concentrates and degree of clarification in the centrifuged reconstituted juices were determined. Results are given in the frequency distribution tables in Table 6.

The physical stability of the frozen orange cencentrates collected during the 1953-54 season was the poorest as indicated by the degree of gelation and clarification which occurred in these samples when they were stored at 40°F. This is evident from the frequency distribution tables presented in Table 6. Also, there was a marked increase in the stability of both the midseason and late season samples from the 1954-55 season. No gelation was observed in 70.0 and 84.3 per cent of the 1954-55 midseason and late season samples, whereas only 24.7 and 38.9 per cent of the 1953-54 products were in this category when examined after storage for 72 hours at 40°F. The percentages of the midseason and late season samples from 1953-54 in which no clarification occurred were 24.8 and 25.0 per cent, respectively, as compared to 34.4 and 53.3 per cent of the 1954-55 midseason and late season samples in which the degree of clarification was also none. Keeping in mind that the stability test used for concentrates from the last three seasons were based on storage for 96 hours at 40°F., it is evident from data in Table 6 that stability of these products continued to improve until during the last two seasons an exceeding small percentage of the samples after storage formed undesirable semi- or solid gels. Definite and extreme degrees of clarification were found in 6.1 and 4.1 per cent of the midseason samples for the last two years and correspondingly in only 1.0 and 1.3 per cent of the late season samples.

As previously reported (12, 8) the principal factors which affect gelation and clarification in citrus concentrates are pectinesterase activity, amount of water-soluble pectin, and the quality or grade of the pectin. The continuous improvement noted above in the stability of the concentrates during the five seasons was primarily the result of the decrease in the pectinesterase activity in the samples, which was caused as already mentioned by increased temperature and/or length of time for heat treatment of the raw or partially concentrated juices. An increase in cloud stability would also be expected with an increase in the water-soluble pectin in the concentrates, as indicated in Table 4, provided the grade of the pectin was the same (12).

Hesperidin is the principal flavonoid found in orange juice. Flavonoids were determined, as hesperidin, by an adaptation of the Davis method (4, 5), and are expressed as milligrams per 100 milliliters (mg/100 ml) of reconstituted juice. The flavonoid content appears to be slightly greater in the midseason than in the late season samples, as shown by results in Table 7, except for the 1957-58 concentrates. This is substantiated by midseason sample averages of 78.5, 85.8, 82.8, 85.0 and 82.8 mg/100 ml and late sea-

(continued on page 13)

Comparison Of Some Characteristics Of . . . Commercial Concentrated Frozen Orange Juices[1]

(continued from page 11)

son averages of 71.6, 81.4, 76.2, 88.3, and 75.1 for the five seasons beginning with 1953-54. The majority of the samples were within the flavonoid range of 60 to 99 mg/100 ml of reconstituted juice. The lowest values in both the midseason and late season samples occurred in the 1953-54 season, whereas the highest values were found in the midseason samples from 1954-55 and in the 1957-58 late season products. Marked increases occurred in both midseason and late season 1954-55 samples, which were perhaps caused by the increases in pulp content as indicated in Table 1. Differences in flavonoid content between samples from the last four seasons varied more in the late season concentrates than in those from midseason packs. When freeze-damaged fruit was used during the 1957-58 season, the midseason and late season samples had high average values of 85.0 and 88.3 mg/100 ml, respectively.

SUMMARY

A study was made of some of the characteristics of 1038 samples of commercial frozen concentrated juice, which were obtained from Florida plants during five citrus seasons. These samples consisted of 564 midseason and 474 late season samples which were examined for pulp content, water-insoluble solids, pectinesterase activity, water-soluble or serum pectin, and flavonoid content. Degrees of gelation and clarification were also determined initially and after storage at 40°F. Information on these characteristics is presented in the form of frequency distribution tables and also as sample averages.

The amount of pulp, water-insoluble solids, water-soluble or serum pectin, and flavonoids was somewhat greater in midseason samples of frozen orange concentrate than that found in late season samples. Midseason products had a better cloud or turbidity in the reconstituted juices. There was no difference in the pectinesterase activity in the midseason and late season concentrates.

The pulp content, water-insoluble solids and initial cloud were greater in both the midseason and late season samples during the 1956-57, 1957-58, and 1958-59 seasons than that in concentrates packed during 1953-54 and 1954-55.

Pectinesterase activity decreased progressively during the five seasons in all samples, while the water-soluble or serum pectin increased continuously throughout this period. Stability of the frozen orange concentrates markedly improved during the five seasons, as shown by less gelation and less loss of cloud or clarification during storage of the product at 40°F. The decrease in the pectinesterase activity was the primary cause of the better stability. The concentrates packed in the last three seasons showed much less tendency to either gel or clarify than those processed during the first two seasons.

Comparison of the differences in the characteristics of the concen-

Table 6. Comparison of frequency distribution tables for degree of gelation and clarification after storage for 96 hours at 40°F. of samples from midseason and late season packs of commercial frozen concentrated orange juices collected during five citrus seasons.

	Midseason					Late season				
	Number of samples and season					Number of samples and season				
	89	113	114	99	118	72	102	98	94	94
Degree of gelation	1953-54[1,2]	1954-55[2]	1956-57	1957-58	1958-59	1953-54[1,2]	1954-55[2]	1956-57	1957-58	1958-59
	% of samples					% of samples				
0—None	24.7	70.0	57.1	82.8	80.5	38.9	84.3	48.9	68.2	74.6
1—Very slight	49.4	17.8	21.9	9.2	17.9	49.9	6.3	28.6	14.8	25.4
2—Slight	19.2	9.5	21.0	7.0	1.6	11.2	8.2	22.5	17.0	0.0
3—Semi-gel	5.6	2.7	0.0	1.0	0.0	0.0	1.2	0.0	0.0	0.0
4—Solid gel	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Degree of clarification[3]										
None	24.8	34.4	72.0	93.9	94.2	25.0	53.3	76.6	99.0	98.7
Slight	13.6	13.3	6.1	0.0	1.7	19.5	20.0	4.1	0.0	0.0
Definite	23.5	26.6	15.8	5.1	1.6	19.5	21.3	9.1	0.0	1.3
Extreme	38.1	25.7	6.1	1.0	2.5	36.0	5.4	10.2	1.0	0.0

[1]Data for 1953-54 season obtained by R. W. Olsen and E. L. Moore on 161 of the 221 commercial samples and published in research reports of the Fifth Annual Citrus Processors' Meeting, Lake Alfred, Fla., October 12, 1954.
[2]Samples stored for 72 hours at 40°F.
[3]Clarification measured as percentage light transmittance of centrifuged reconstituted juice using Lumetron colorimeter, Model 402-E, filter No. 730 and 14 ml cell. Degree of clarification for orange juice: 0-59%=none; 60-69%=slight; 70-84%=definite; 85-100%=extreme.

trates during the five seasons with changes that were made in commercial extraction and finishing procedures to increase the yield of juice showed the higher levels of pulp, water-insoluble solids, and flavonoids resulted as the juice yield increased. Such increases in pulp content and water-insoluble solids caused higher pectinesterase activity in the concentrates and consequently the temperature and/or time of heat treatment for enzymic inactivation was gradually increased, which eventually resulted in very stable products having very little tendency to gel or clarify.

Changes in the characteristics caused by the utilization of freeze-damaged oranges during the 1957-58 season were a decrease in the water-insoluble solids and a slight decrease in pulp content. These changes resulted from modification of extraction and finishing procedures to give slightly lower yields of juice, so as to minimize the possibilities of gelation and flavor problems. Initial cloud in reconstituted juices was greater during 1957-58 than during any of the other seasons chiefly because of larger amounts of water-soluble pectin in the concentrates produced from the freeze-damaged fruit. Flavonoid content, determined as hesperidin, was also found to be greater .

Comparing seven characteristics of samples of frozen orange concentrate packed during the 1958-59 season with those packed in 1953-54 showed the following major differences between products recently produced with those packed six years previously, (a) greater pulp content, (b) larger amounts of water-insoluble solids, (c) very much lower pectinesterase activity, (d) more water-soluble or serum pectin, (e) better cloud or turbidity initially, (f) very much greater stability or tendency not to gel or separate, and (g) higher flavonoid content.

ACKNOWLEDGEMENTS

The authors wish to thank the Florida companies that supplied all of the commercial samples of frozen concentrated orange juice that were used in this investigation. For the 1956-57, 1957-58, and 1958-59 citrus season these companies were Adams Packing Association, Inc.; B and W Canning Company, Inc.; Florida Citrus Canners Cooperative; Florida Citrus Processors, Inc.; Florida Food Products, Inc.; Mid-Florida Citrus Cooperative; Tropicana Products, Inc.; General Foods Corporation; H. P. Hood and Sons, Inc.; Lakeland Highlands Canning Company, Inc.; Laurie-Massey Citrus Products, Inc.; Libby, McNeill & Libby; Minute Maid Corporation; Pasco Packing Company; Plymouth Citrus Products Cooperative; Ridge Citrus Concentrate, Inc.; Salada-Shirriff-Horsey, Ltd.; Snively Groves, Inc.; Southern Fruit Distributors, Inc.; Stokely-Bordo; Tree-Sweet Products Company; and Winter Garden Citrus Products Cooperative. Samples were also supplied by other companies during previous years, which because of management or other changes were not in existence during the last three seasons.

The assistance of personnel of the Agricultural Marketing Service, USDA, Winter Haven, Florida, and of R. W. Barron and M. D. Maraulja of the Florida Citrus Commission in obtaining these samples from the commercial plants was also appreciated.

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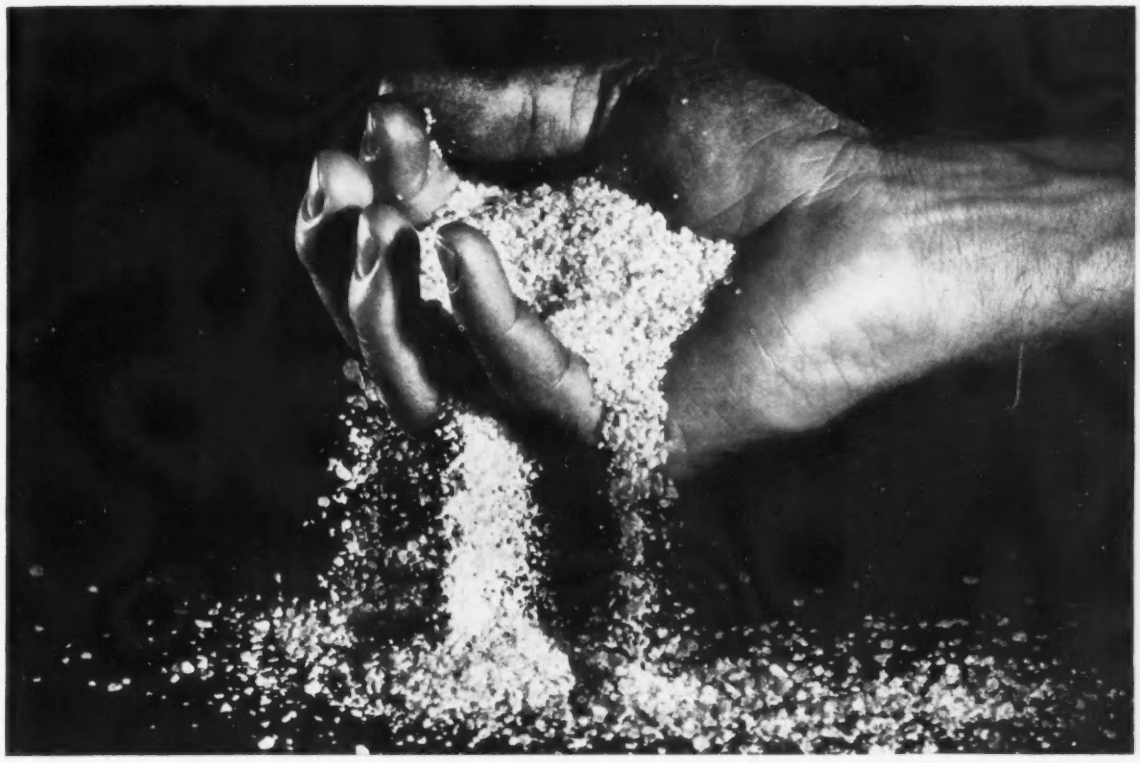
Table 7. Comparison of frequency distribution tables of flavonoids in samples from midseason and late season packs of commercial frozen concentrated orange juices collected during five citrus seasons.

Flavonoids, as hesperidin, in reconstituted juice[1] mg/100 ml	Midseason					Late season				
	Number of samples and season					Number of samples and season				
	120	113	114	99	118	101	102	98	94	79
	1953-54	1954-55	1956-57[2]	1957-58	1958-59	1953-54	1954-55	1956-57[2]	1957-58	1958-59
	% of samples					% of samples				
20- 59	10.9	0.0	0.0	0.0	0.8	14.9	0.0	1.1	0.0	1.3
60- 69	20.1	3.6	3.5	10.1	8.5	23.6	11.8	14.3	6.4	29.1
70- 79	24.1	26.6	34.2	34.3	36.4	32.8	39.2	62.3	12.7	48.1
80- 89	24.1	39.0	43.9	28.3	33.1	21.9	33.4	13.2	36.1	13.9
90- 99	10.8	22.1	11.3	11.1	13.6	6.8	11.8	7.2	27.7	7.6
100-109	6.6	6.3	6.2	12.1	5.8	0.0	3.0	1.9	14.0	0.0
110-119	1.7	1.7	0.9	3.1	0.0	0.0	0.8	0.0	2.1	0.0
120-139	1.7	0.7	0.0	1.0	0.8	0.0	0.0	0.0	1.0	0.0

[1]Determined by an adaptation of the Davis method (4, 5).
[2]Data for 1956-57 survey obtained by E. C. Hill, and published in research reports of Eighth Annual Citrus Processors Meeting, Lake Alfred, Fla., September 26, 1957.



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Hancock Announces Candidacy For Agriculture Position

W. R. (Buster) Hancock, Groveland, has recently announced himself as a candidate for the office of Florida commissioner of Agriculture subject to the May Democratic primaries.

Hancock who resides in Groveland where he owns and operates grove property, has been long associated with the citrus affairs in the state, and has a wide acquaintance among the state's growers.

He said his state campaign headquarters will be in Orlando. O. B. McEwan, Orlando attorney, will be state campaign manager with the First National Bank of Orlando official depository for campaign funds. W. C. Daley, Orlando CPA, was named campaign treasurer.

The 42-year-old owner and operator of Hancock Groves in neighboring Lake county was born at Pinetta in Madison county. He received an agricultural degree at the University of Florida. He was in the Marine Corps air arm in World War II.

Hancock was secretary and a member of the agricultural service committee which made a two-year study and recommendations for reorganization of the state department of agriculture, which was passed by the 1959 Legislature to become effective next year.

Comparison Of Some Characteristics Of . . . Commercial Concentrated Frozen Orange Juices,

(continued from page 14)

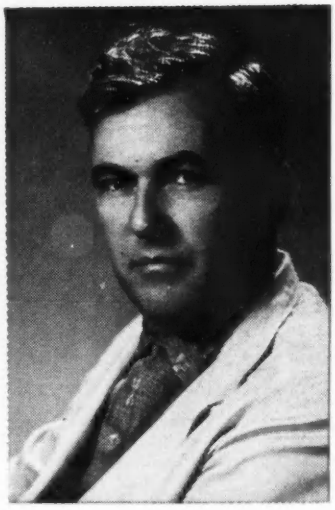
and E. L. Moore, 1958. Chemical characteristics of citrus juices from freeze-damaged fruit. Proc. Florida State Hort. Soc., 71: 216-220.

14. U. S. Department of Agriculture, Agricultural Marketing Service, Washington, D. C. United States standards for grades of frozen concentrated orange juice. December 1, 1955.

15. U. S. Department of Agriculture, Agricultural Marketing Service, Washington, D. C. United States standards for grades of frozen concentrated grapefruit juice. December 28, 1956.

16. Wenzel, F. W., R. W. Barron, R. L. Huggart, R. W. Olsen, and M. D. Maraulja. 1958. Comparison of color and flavor in frozen concentrated orange juice. Proc. Florida State Hort. Soc., 71: 274-278.

Perkins Manufacturing Enterprises Open Winter Haven Plant



B. B. (Bun) Perkins, general manager of Perkins Manufacturing Enterprises, Inc., announces the opening of their plant in Winter Haven.

The plant is designed to build the Farwell Tree Hoe as its first project, and plans to manufacture virtually all agricultural implements which are capable of use in Florida.

In the meantime the plant will be devoted to doing general machine shop work and to do custom building of equipment of every description.

Perkins served in the Navy where he was commissioned as a pilot. After his release from the Navy he was associated with the Speed Sprayer company.

He calls attention to the saving on freight on the products his company will manufacture and the fact that these products will be designed and built to supply the specific needs of Florida growers.

WATKINS ANNOUNCES EXTENSION SERVICE PERSONNEL CHANGES

Gainesville, Fla.—Three resignations, three appointments and one change in title head the list of staff changes announced by Dr. M. O. Watkins, director of the Florida Agricultural Extension Service.

Three resignations are from the home demonstration staff, according to Miss Anna Mae Sikes, state agent in Tallahassee. After two years as home demonstration agent in Putnam County, Mrs. Esther F. Harper is resigning February 15.

Mrs. Ruth T. Penner, home agent in St. Johns County, will leave January 31 to accept an extension position in Hawaii. She has been with the Extension Service for 11 years.

Dorothy P. Parker, Negro home demonstration agent in Jackson County, will resign January 31.

Miss Ruth L. Milton, assistant home demonstration agent, Manatee County, has been named acting assistant state girls' 4-H Club agent. She begins this work February 15.

Appointments include two assistant county agents and an assistant County home demonstration agent. William M. Nixon will become assistant Lake County agent February 1, replacing James R. Connell. Nixon is a native of Morgantown, West Virginia. He will work primarily with 4-H Clubs, vegetable and ornamentals.

Mrs. Cora H. Meares was appointed assistant home demonstration agent in Pinellas County. A native of St. Paul, Minnesota, she is a home economics graduate from Florida State University. She has been teaching in Pinellas County.

Robert B. Christmas will become assistant county agent in Orange County February 1, replacing Shelby L. Brothers. A native of Cottondale, Florida, he graduated from Chipola Junior College in Marianna and the University of Florida.

Conner Announces For Agriculture Commissioner

Doyle Conner, Starke, has announced his candidacy for the commissioner of agriculture in the forthcoming Democratic primaries.

Conner is probably best known for his long service as speaker and representative in the House in Florida's legislature.

He has a varied record of experience in business and agriculture and for service on several state boards.

In his announcement he states "the new Commissioner must have a practical farm background and experience in closely allied fields such as administration, legislation, taxation, education, public health and welfare.

His campaign headquarters will be located in Miami where he is interested in the insurance and real estate business.

DU PONT

zineb fungicide

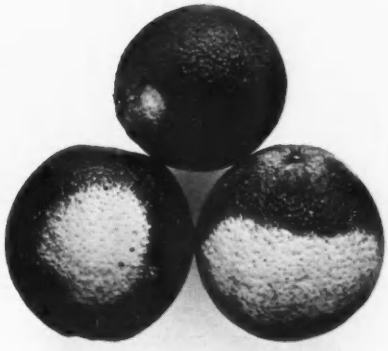
for control of greasy spot and fruit russeting

PARZATE C

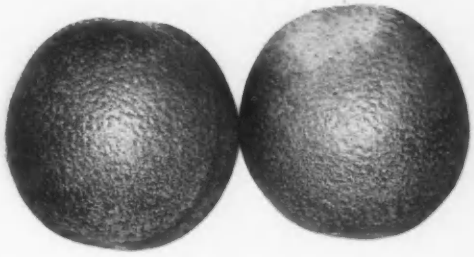
FERMATE

ferbam fungicide

for control of anthracnose and scab



Russeting—Symptoms of damage from rust mites feeding on nearly mature fruit.



Russeting—Symptoms of damage resulting from rust mites feeding on fruit when it was small.

Scab—Lesions on Temple orange leaves.

Anthracnose—Lesions on rough lemon leaves.

Greasy spot—Typical damage to grapefruit leaves.

DU PONT

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Better Things for Better Living... *through Chemistry*

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New Early Maturing Tangerine Hybrids

PHILIP C. REESE AND FRANK E. GARDNER
Crops Research Division, Agricultural Research Service
United States Department of Agriculture

Paper presented at Florida State Horticultural Society, 1959

Natural hybridization, occasional mutation, and subsequent horticultural selection have produced most of the citrus varieties in existence today. Not until the pioneer systematic breeding experiments by W. T. Swingle and H. J. Webber of the U. S. Department of Agriculture was artificial hybridization of citrus recorded. The first cross-pollinations were made in Florida in 1893, and a great deal of citrus hybridization was continued until about 1914. During this period many hybrids of diverse parentage and characteristics were produced. The most important for fresh fruit were the tangelos, which are hybrids between grapefruit and Dancy tangerine.

Sytematic citrus breeding were not resumed by the Department of Agriculture until 1942, when 35 crosses were made on a large scale by John M. Bellows at the U. S. Horticultural Field Station at Orlando, Florida. Shortly afterward, Bellows left the Department of Agriculture, and the breeding work has been carried forward by other workers who have made scores of additional crosses. At present the progeny of these crosses are in various stages of development, and citrus breeding is being expanded by the U. S. Department of Agriculture in Florida, Texas, and California.

In resuming the citrus breeding work the Department felt that a real need existed for true, loose-skinned tangerine types currently being filled in Florida only by Dancy tangerine and in Texas and California chiefly by the Algerian tangerine (Clementine). The Clementine, although rather seedy and usually shy-bearing, is early-maturing and of high quality; for these reasons it was selected as one parent Not until later, in attempting to distinguish hybrid from nucellar seedlings, did Furr and Reece (2) learn that, as a female parent, Clementine has another and very important charactistic, failure to produce nucellar seedlings. Many other parents were used, but are not listed here, for Clementine x Orlando tangelo proved to be a very fortunate cross that yielded an unusually high percentage of promising hybrids including the three described here. In a population of only 327 seedlings a wide range of forms occurred. Most of them are predominantly tangerine in type. A few somewhat resemble oranges; other are like tangelos. Most of them are early maturing, large and sweet and have a red peel color, but unfortunately they are rather seedy in mixed plantings. Prominent navels are characteristic of many of these F_1 hybrids.

Because Clementine has been a useful parent in citrus breeding, it may be desirable to include here something about its origin. In 1902 the chief of the botanical service in Algeria, L. Trabut, described a new tangerine variety called Clementine, repeated to be a natural hybrid between "Granito," a particular strain of sour orange, and tangerine (4). Whether the Clementine actually carries any sour orange inheritance remains an unanswered question. However, Clementine budwood was sent in 1909 to W. T. Swingle, who propagated the variety at Glen St. Mary, Florida. He used it as the pollen parent in a cross with a grapefruit to produce the Clement tangelo. There is no record that Swingle ever used it as a seed parent.

The Orlando tangelo, the pollen parent of the tangerine hybrids described here, is itself a hybrid of Bowen grapefruit by Dancy tangerine, made at Eustis, Florida, in 1911. In 1931 it was introduced with several sister hybrids by Swingle, Robinson, and Savag (3).

Robinson Tangerine Hybrid

The Robinson variety (Orlando No. 426-7-4) is the earliest of the new hybrids. It sometimes breaks color as early as September 15 and reaches prime eating condition in late October. The parent tree has the habit of regular bearing.

Technical description: Fruit color Ridgeway cadmium-orange to orange-chrome; surface smooth and glossy; shape oblate; size medium large, diameter 3 inches, height 2¼ to 2½ inches; apex broadly depressed, base evenly rounded or only slightly necked, calyx small and incon-

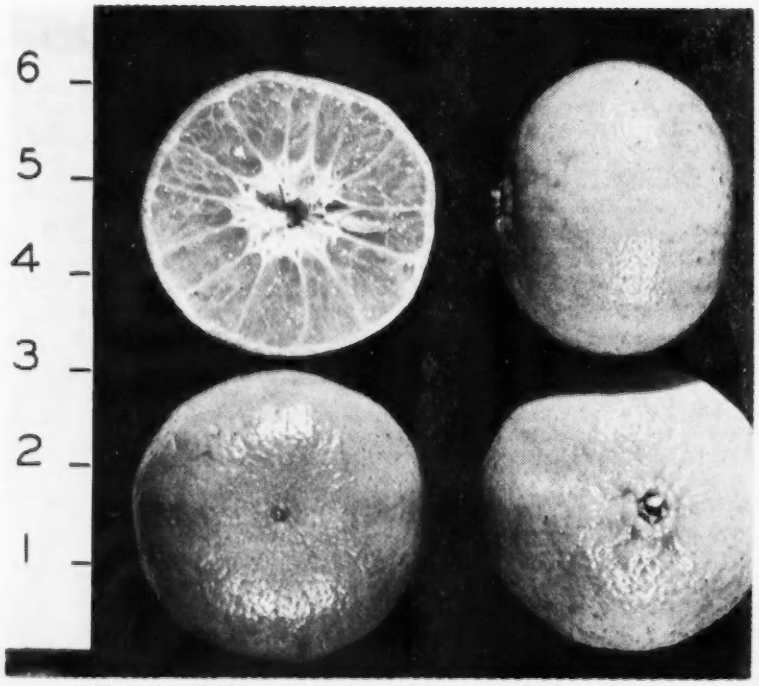

Plate 1—Robinson tangerine hybrid (Orlando No. 426-7-4)

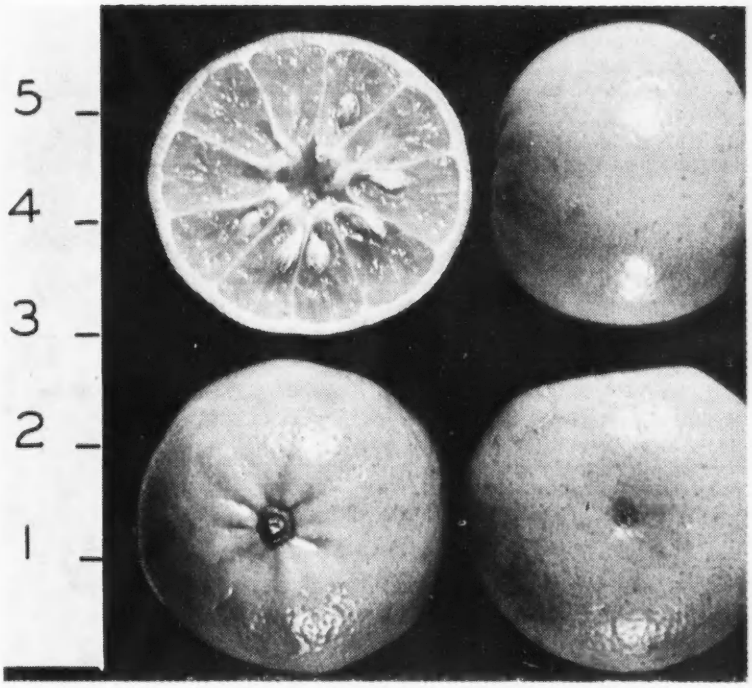

Plate II — Osceola tangerine hybrid (Orlando No. 426-12-3)

spicuous; stem slender; rind thin, 1/8 to 3/16 inches, leathery, tough, and easily removed; axis large, hollow; segments 12 to 14; pulp dark orange, flavor rich and sweet; seeds 10 to 20; cotyledons Ridgway glass-green. Season October to December.

Trees thornless or nearly so; foliage dense, leaves broadly lanceolate, large, length 3½ to 4¼ inches, width 1½ to 2½ inches, margin crenate, particularly the upper half of the leaf; apex tapering to a point or frequently rounded and notched at tip; petioles if present very slightly winged, length 3/8 to 1/2 inch. Branches nearly thornless, erect, spreading under weight of fruit.

Osceola Tangerine Hybrid

The Osceola (Orlando No. 426-12-3) is an exceptionally high-colored hybrid that usually produces heavy crops of attrative fruit somewhat lower in solids and higher in acids than the Robinson. The variety is at its best in November, and the flavor is generally acceptable.

Technical description: Fruit color Ridgway cadmium-orange to almost coral-red; surface smooth and glossy; shape oblate; size medium, diameter 2-¾ to 3 inches, height 2 to 2¼ inches; base mainly flattened, slightly corrugated, stem slender, calyx very small an inconspicuous; apex smoothly flattened or slightly depressed; rind thin, 1/8 inch, leathery, and rather easily removed but not loose and baggy, and of a character pudged to carry well in shipment; axis hollow, large; segments 10 or 11; pulp dark orange, flavor rich and unusual; seed many, 15 to 25; cotyledons very pale green, almost white. Season November.

Trees nearly thornless; twigs more upright than Clementine; foliage dense; leaves lanceolate, length 2½ to 3 inches, width 1½ to 1-¾ inches, apex acute but often blunt-obtuse; margin almost entire—very slightly crenate; petiole 3/8 to 1/2 inch, wingless.

Lee Tangerine Hybrid

The fruit of Lee (Orlando No. 421-36-4) somewhat resembles an orange in size and shape or its pollen parent, the Orlando tangelo. Although fruit of this variety contains medium high solids and rather low acids, it develops good rind color by late October or early November. A high ratio of solids to acids produces a fruit that tastes very sweet. The fruit can be peeled easily and resembles a Temple orange in this characteristic.

Technical description: Fruit color Ridgway orange-chrome to cadmium-orange; surface smooth and glossy; size medium, diameter 2-¾ to 3-¼ inches, height 2--5/8 to 2-7/8 inches; shape nearly round, basal area slightly raised and furrowed; calyx small; apex evenly rounded or slightly flattened with a styler scar, diameter 1/8 to 1/4 inch, slightly depressed; rind thin, 1/8 inches, leathery, and easily removed, axis large, hollow except for often a central placental axis free from segments; segments

(continued on page 22)

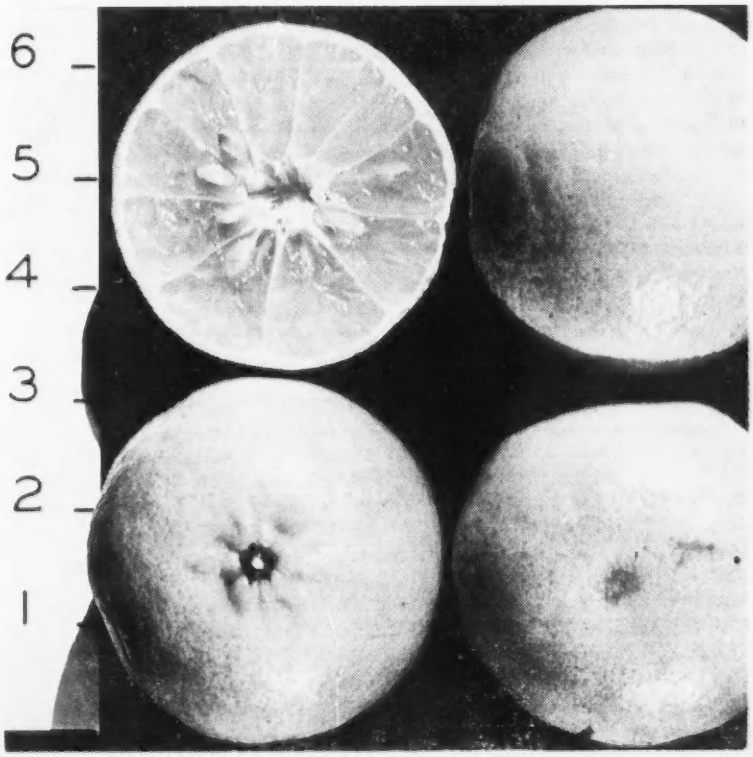

Plate III — Lee tangerine hybrid (Orlando No. 421-36-4

Frank L. Holland Named Man Of Year In Service To Fla. Agriculture

Frank L. Holland, manager of the Florida Agricultural Research Institute, has been named 1959 Man of the Year in Service to Agriculture for his state by The Progressive Farmer magazine. The announcement was made in the magazine's January issue.

With the Florida Agricultural Research Institute since its beginning in 1933, Holland has helped it grow from a membership of 11 to a group of 46 commercial and cooperative fertilizer and pesticide manufacturers working closely together.

The Institute encourages research to find the best fertilization program for specific crops and soils. It looks for the most effective controls for plant and insect diseases and works for legislation fair to both consumer and manufacturer, insisting on proper labeling, sampling, and inspection to protect the consumer.

Mr. Holland was one of the organizers and first chairman of the Florida Agricultural Council. He is secretary of the Florida Conference Group, composed of representatives of grower organizations, industry, and college. He has served as president of the Florida State Horticultural Society, one of the oldest organizations of its kind in the country. In 1954, Mr. Holland received the Florida Fruit and Vegetable Association's award of distinction.

Mr. Holland joins these men who have been honored in past years with this Award:

Hon. Nathan Mayo, 1937; Wilmon Newell, 1938 (deceased); A. B. Spencer, 1939 (deceased); H. G. Clayton, 1940; H. O. Partin, 1941; J. D. Warner, 1943 (deceased); L. H. Kramer, 1944 (deceased); Dr. Arthur Forrest Camp, 1945; P. E. Williams, 1946; Walter B. Anderson, 1947; Edwin Hall Finlayson, 1948; Paul B. Dickman, 1949; Loring Raoul, 1950; Harry E. Wood, 1951; V. C. Johnson, 1952; James J. Love, 1953; J. Francis Cooper, 1954; Dr. Williard Merwin Fifield, 1955; Wm. Robert (Buster) Hancock, 1956; Dr. J. Wayne Reitz, 1957; Robert E. Norris, 1958.

USDA AMENDS GRADE STANDARDS FOR CANNED ORANGE JUICE

The U. S. Department of Agriculture has announced an amendment to the U.S. Standards for Grades of Canned Orange Juice to permit standardization of this product by adding frozen orange concentrate or other suitable ingredients permitted under regulations of the Federal Food and Drug Administration.

Current Food and Drug regulations require that any such additives be properly declared on the labels.

Addition of canned concentrated "hot pack" orange juice is specifically excluded by the amendment to the grade standards.

The amendment became effective on publication in the Federal Register dated Jan. 21.

Standardization is designed to improve the quality of canned orange juice, particularly that packed from early season varieties. USDA believes this action will benefit conproviding canned orange juice of providing canned orange juice of more uniform quality throughout the packing season.

CITRUS AND SUB-TROPICAL FRUIT RESEARCH NOW BEING CONDUCTED

USDA's Citrus Advisory Committee Sees Need for Harvesting and Utilization Studies:

Studies to speed mechanization of citrus harvesting and handling and to increase utilization of citrus products are important present needs of the citrus industry, according to the U. S. Department of Agriculture's Citrus and Subtropical Fruit Research and Marketing Advisory Committee. The committee held its annual meeting in Washington, Nov. 2-6.

Some progress has been made toward more efficient bulk handling of citrus, but development of mechanical aids for picking would help to cut labor costs and improve the quality of fruit, the committee noted.

Basic chemical composition studies should be pursued, the committee said, on citrus and subtropical fruits and their products such as juices and concentrates and such by-products as the essential oils. The aim of the research would be development of new processes for making citrus products, improvement of methods for determining fruit quality and purity, and development of pharmaceutical uses for citrus constituents.

In the marketing field, top need is for investigations to develop both chemical and physical methods for determining fruit quality and maturity in order to improve grading and inspection of fresh and processed fruit.

An expanded plant breeding research program is also needed, the committee said. Especially important is development of early- and late-maturing, high quality, disease-resistant, cold-hardy, productive new citrus varieties.

The committee also approved a full slate of proposals for improving the citrus marketing services of USDA. The committee noted increasing needs for additional information on truck receipts from cities not now covered by USDA market news reporting services.

Rated high in priority by the committee also are: (1) Further studies on the effects of storage time and temperature on the quality of frozen citrus products; (2) Basic research on the postharvest diseases that occur in citrus and subtropical fruits as well as basic studies of the physiological basis for citrus rind disorders; and (3) A search for new rootstocks with disease resistance, salt tolerance, and adaptability to various soils.

Established under the Research and Marketing Act of 1946, the committee is made up of national leaders in the citrus industry. Its detailed recommendations for citrus and subtropical fruit research to be undertaken by USDA will be submitted formally to the Department within the next few weeks. Copies will be available from the committee's executive secretary, Dr. Roy Magruder, Office of the Administrator, Agricultural Research Service, U. S. Department of Agriculture, Washington 25, D. C.

A. L. Chandler, Redlands, Calif., was named chairman to succeed M. H. Walker, of Lake Wales, Florida. M. W. Held, of Mission, Texas, was named vice-chairman.

Other committee members who attended were: Horace Etchinson, McAllen, Texas; L. F. Fadler, Pittsburg, Kans.; Willard M. Fifield, Gainesville, Fla.; John T. Lesley, Tampa, Fla.; Allen T. Lombard, Fillmore, Calif.; and Phill S. Twombly, of Fullerton, Calif.

NEW EARLY-MATURING TANGERINE HYBRIDS

(continued from page 19)

9 or 10, usually 10; rag little, pulp orange, melting, tender; flavor rich and sweet; seeds 10 to 25 in mixed plantings; cotyledons Ridgway pale-veronese-green to glass-green. Season October to November.

Tree average for mandarin group, almost thornless; foliage dense; leaves lanceolate, length 3 to 3½ inches, width 1¼ to 1-¾ inches, apex and base acute, margin very slightly crenate; petiole length 3/8 to 1/2 inch, wingless.

Discussion

Although these tangerine hybrids derive part of their inheritance from the Bowen grapefruit through the Orlando tangelo, they are predominantly tangerine in general characteristics. The Robinson and Osceola varieties closely resemble tangerines. However, the fruit of the Lee variety possesses some qualities that somewhat suggest a tangelo or even a round orange. These varieties are "specialty fruits" that all mature when most Dancy tangerines are still unable to meet the maturity standards. In "Seasonal Change in Florida Tangerines," Harding and Sunday (1) said that "Dancy tangerines reached the minimum standards of consumer acceptance about the middle of November. Prime eating condition was reached in January and February." The Robinson, Osceola and Lee tangerine hybrids will enable the grower to supply the public with mandarin fruits that are larger, sweeter, more high-colored than Dancy tangerines.

Although a few trees of each variety have been tested on several rootstocks, the information regarding their performances is exceedingly limited. Little is known regarding their cold tolerance or their disease and insect susceptibility. Because both parents, Clementine tangerine and Orlando tangelo, are unfruitful when self-pollinated, it would not be surprising to find that their progeny have the same characteristic. Therefore, a word of caution should be given against making extensive plantings of these varieties until additional information is available on their behavior in solid plantings and on their rootstock response. Preliminary tests indicate that Rough lemon rootstock results in a marked lowering of their fruit quality and should not be used. Present indications suggest that Osceolas on Cleopatra rootstock, at least on young trees, are shy bearing.

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3. Swingle, W. T., T. Ralph Robinson, and E. M. Savage. 1931. New Citrus Hybrids. U. S. Dept. Agr. Circular No. 181.

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CITRUS INSECT CONTROL—SPRING 1960

(continued from page 6)

oil-parathion mixture may cause as much or more injury as 1.3% oil, but the oil-malathion mixture has been less harmful.

No more than one oil spray should be used during any crop year whether 0.7% or 1.3% oil is used and regardless of the dates of application. For this reason oil is recommended for post-bloom use only where parathion or malathion are to be used in subsequent sprays. Furthermore, oil is not recommended when the average size of fruit is between 0.75 and 1.25 inches in diameter because it may blotch fruit in this size range.

If a mealybug infestation develops, apply either 0.25 pound of actual parathion or 0.75 to 1.25 pound of actual malathion per 100 gallon. These materials are also effective in combination with oil.

Any spray intended to control mealybug should be applied before the calyx fits close to the fruit so that the spray will contact the mealybugs. Make a thorough application on leaves, fruit, trunk and limbs.

SPIDER MITE CONTROL

Citrus red mite (purple mite) and to a lesser extent, Texas citrus mite will be numerous during the post-bloom period with maximum populations in May and June. Citrus red mite will be most numerous early in the season in groves receiving copper and/or sulfur sprays. This outbreak may be prevented with 0.7 to 1.3% oil or Tedion, but other miticides such as Trithion, Kelthane or Systox cannot be expected to last from post-bloom until time to apply the summer scalicide. Although uncontrolled citrus red mite and Texas citrus mite feeding will severely dull citrus foliage, it will rarely cause a severe leaf drop at this time of the year in healthy groves as long as soil moisture is good. Therefore, unless oil or Tedion are used, it is not practical to attempt spider mite control with a post-bloom spray unless soil moisture is extremely low.

Tedion was recently approved by the Federal Food and Drug Administration for use on citrus citron, grapefruit, limes, oranges, tangelos and tangerines. It cannot be used on lemons and must not be used on any crop of fruit more than once.

It is recommended that Tedion be used only once each year whether fruit is present or not because its chemical nature suggests the repeated use could lead to resistant mites. Since Tedion, although slow to bring mites under control, is capable of exceptionally long periods of control, the once-a-year application should be made in September, October or November when it is possible to take the greatest advantage of its long-lasting properties. However, if post-bloom mite control is considered essential, it is preferable to use Tedion at that time and to resort to another miticide in the fall.

Six-spotted mite may be controlled with materials used for purple mite, but more thorough coverage is needed for satisfactory results.

RESIDUES AND TOLERANCES

The Federal Food and Drug Administration has established tolerances on amounts of certain pesticide residues that can remain on citrus fruits. In order to produce fruit free of illegal residues, it is necessary to observe all restrictions such as waiting periods on manufacturer's labels.

JONES IS APPOINTED TO AGRONOMY STAFF OF EXTENSION GROUP

Gainesville, Fla.—David W. Jones, associate county agricultural agent in Lee, Charlotte, Hendry, Glades and Collier counties, has been named associate agronomist with the Florida Agricultural Extension Service in Gainesville.

Dr. M. O. Watkins, director, says Jones will begin his new work February 1. He has worked with the Extension Service since January 1957.

The Reduction of Rind Breakdown Of Marsh Grapefruit

By Polyethylene Emulsion Treatments

PAUL L. DAVIS AND PAUL L. HARDING
U.S.D.A., Orlando, Florida

Presented Before Florida State Horticultural Society Meeting

Introduction

Pitting, a form of rind breakdown of oranges and grapefruit in storage, occurs frequently. The cause is uncertain. In the course of studies on the basic causes of this disorder of citrus fruits various agents were used to accelerate or inhibit the development of pitting during storage.

One material, a liquid polyethylene emulsion, was found to decrease the incidence and severity of rind breakdown of grapefruit even at storage temperatures at which severe pitting usually occurs. The studies presented here were made to determine the effect of two polyethylene formulations on the pitting of Marsh grapefruit.

Materials and Methods

The formulations of the two liquid polyethylene emulsion concentrates used were as shown below:

	A	B
	Per cent	Per cent
Polyethylene	20.0	30.0
Emulsifier [1]		7.5
Potassium hydroxide		0.7
Oleic acid	4.0	
Morpholine	4.0	
Water	72.0	61.8

[1] Tergitol NPX, an alkyl phenyl polyethylene glycol ether.

These were obtained from the Allied Chemical Corporation and diluted to contain 10 per cent solids before use.

Marsh grapefruit from two commercial groves, one on rough lemon rootstock at Groveland, Florida, and one on sweet orange rootstock at Windermere, Florida, were used during the 1958-1959 season.

Emulsion "A" was applied to two lots from the first grove and to three lots from the second grove. Emulsion "B" was applied to three lots from the first grove and to four lots from the second grove.

The fruit was washed before treatment, and treated within three days after picking.

Average size fruit, without rind punctures was selected. The fruit was dipped singly into diluted emulsions of "A" or "B" for a period of 20-30 seconds. Each fruit was allowed to drain and then dried under a hot air dryer. The fruit was then stored for a period of five weeks at low temperatures.

Inspection of the fruit was made on removal from storage and again after seven days at 70 degrees F, for severity of pitting and for decay. Pitting was classified as light if the aggregate affected area was from 8 to 20 millimeters in diameter, moderate if from 20 to 32 millimeters, and severe if over 3 millimeters.

Untreated samples were stored with each treated lot. Most of the storage tests were conducted at 40 degrees F, because pitting occurs most readily at about this temperature. Taste tests were conducted as described by Harding and Fisher (4).

Results and Discussion

In all tests with emulsion "A" the total amount of pitting was less in treated than in untreated fruit and the severity of pitting in the affected fruit was decreased (Table 1). On removal from 40 degrees F storage the treated fruit had an average of 79 per cent sound fruit, with slight, moderate, and severe pitting averaging 16, 4, and 1 per cent respectively.

Untreated fruit had an average of only 47 per cent sound fruit on removal, with averages of 33, 10, and 9 per cent slight, moderate and severe pitting. At the end of the holding period the treated fruit remained firm and retained good color but had somewhat more decay than the untreated fruit.

Fruit treated with emulsion "B" also developed less pitting during 40 degree F storage than untreated fruit (Table 1). On removal, treated fruit had an average of 70 per cent sound fruit with slight, moderate, and severe pitting averaging 16, 7, and 4 per cent respectively. Untreated fruit had an average of 34 per cent sound fruit on removal, with averages of 26, 16, and 23 per cent slight, moderate, and severe pitting.

Fruit receiving treatment with emulsion "B" however, tended to become soft during storage. This may have led to the increased decay after removal from storage. Possibly a fungicide could be incorporated in the emulsions to decrease the amount of decay, as has been done with commercial water-wax emulsions. This point is receiving consideration.

Fruit treated with polyethylene "B" and stored at 32 and 50 degrees F, remained relatively free of pitting both during storage and the 7-day holding period at 70 degrees F (Table 2). At 32 degree F storage, 80 percent of the treated fruit was sound after the 7-day holding period, whereas only 16 per cent of the untreated fruit remained sound.

At 50 degree F storage, 84 per cent of the treated fruit was sound after the holding period, and 66 per cent

(continued on page 26)

Table 1—Effect of polyethylene emulsions on pitting and decay of Marsh grapefruit stored for 5 weeks at 40° F, and held at 70° F for 1 week

Formulation	Item	On removal from 40° F storage		After 1 week at 70° F	
		Treated	Untreated	Treated	Untreated
A_2	Number fruit	241	369		
	Sound fruit, pct.	79	47	61	36
	Slight pitting, pct.	16	33	17	29
	Moderate pitting, pct.	4	10	3	13
	Severe pitting, pct.	1	9	2	11
	Decay, pct.	0	1	17	11
B_3	Number fruit	305	527		
	Sound fruit, pct.	70	34	47	25
	Slight pitting, pct.	16	26	11	22
	Moderate pitting, pct.	7	16	5	15
	Severe pitting, pct.	4	23	4	22
	Decay, pct.	3	1	33	16

1 Emulsions contained 10 per cent solids.
2 Figures are averages of 5 individual tests.
3 Figures are averages of 7 individual tests.

THE REDUCTION OF RIND BREAKDOWN OF MARSH GRAPEFRUIT

(continued from page 24)

of the untreated fruit was sound. Of particular interest was the fact that treated fruit stored at 50 degrees F retained its yellow-green "fresh" color, whereas the untreated fruit developed the usual yellow-orange color typical of the fruit stored at higher temperatures.

Although at 70 degrees F little pitting or decay developed, both treated and untreated fruit became shiveled and unappealing in appearance after about three weeks.

Table 2—Effect of polyethylene emulsion "B" on pitting and decay of Marsh grapefruit stored at 32°, 40°, 50°, and 70° F for 6 weeks and held at 70° F for 1 week

Temperature	Item	On removal from storage		After 1 week at 70° F	
		Treated[1]	Untreated	Treated	Untreated
32° F	Number fruit	50	50		
	Sound fruit, pct.	98	94		
	Slight pitting, pct.	2	4	80	16
	Moderate to severe pitting, pct.	0	2	0	16
	Decay, pct.	0	0	6	4
	Weight loss, pct.	1	0		
40° F	Number Fruit	50	50		
	Sound fruit, pct.	60	38	46	30
	Slight pitting, pct.	20	32	10	26
	Moderate to severe pitting, pct.	0	2	30	6
	Decay, pct.	0	2	30	6
	Weight loss, pct.	1	0		
50° F	Number fruit	50	50		
	Sound fruit, pct.	98	80	84	66
	Slight pitting, pct.	0	0	0	0
	Moderate to severe pitting, pct.	0	0	0	0
	Decay, pct.	2	20	16	34
	Weight loss, pct.	0	0		
70° F	Number fruit	50	50		
	Sound fruit, pct.	98	80	84	66
	Slight pitting, pct.	4	2	6	2
	Moderate to severe Decay, pct.	12	18	14	20
	Weight loss, pct.	11	11		

1 Emulsions contained 10 per cent solids.

Weight losses during storage indicated that the polyethylene treatment probably did not interfere with transpiration or normal gas exchange. This was most evident in fruit stored at 70 degrees F, where fruit treated with polyethylene "B" lost 11 per cent and untreated fruit lost the same.

Chemical analyses of the juice of fruit stored at 32, 40, and 50 degrees F showed no effects as the result of polyethylene treatment (Table 3).

The palatability of grapefruit was not impaired by polyethylene treatment. In the taste tests no distinction was made between fruit treated with emulsion "A", that treated with emulsion "B", and untreated fruit, all of which had been in storage at 40 degrees F for five weeks and held at 70 degrees F for one week.

All fruit received a rating of 80-100, which is termed pleasantly tart to sweet, a pleasant blend of sugars and acid, with very good texture and flavor.

A recent review of chilling injury by Pentzer and Heinze (6) pointed out the complexity of the pitting process. The polyethylene film map protect the rind from atmospheric oxidation, or, being slightly basic, may protect the rind from accumulated acidic materials. The effect of the polyethylene film may be a matter of prevention of desiccation since it has been reported by Brooks and McColloch (1) that pitting of grapefruit is much worse at low than at high humidities.

Similar findings with oranges have been reported by Grierson (3). Morris and Platenius (5) found that the severity of pitting of cucumbers was inversely proportional to the relative humidity of the storage atmosphere, although they felt that dessication was not the initial cause of pitting, but the result of injury to certain cells of the epidermis. Waxing and the use of oiled wrappers reduced pitting in lemons (2), and in grapefruit (1).

This effect was attributed to an increase in carbon dioxide content in the internal atmosphere. Thus, another possibility is that the polyethylene film alters gas exchange in a manner which reduces rind injury.

If the costs are not prohibitive, if decay can be controlled, and if there are no health hazards in the use of the fruit so treated, the application of polyethylene coatings offers possibility for commercial use.

Summary

Rind breakdown, or pitting, of grapefruit was reduced substantially by treatment with emulsions of polyethylene before storage. Treated fruit retained normal color and developed no off-flavors or differences in chemical composition of the juice due to polyethylene treatment. Of the two emulsion formulations tested, polyethylene-oleic acid-morpholine was found to be superior to polyethylene-Tergitol NPX-potassium hydroxide.

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Table 3.—Chemical composition of the juice of Marsh grapefruit treated with polyethylene emulsion "B", and untreated fruit after storage at 32°, 40°, and 50° F for 6 weeks[1]

Item	32° F Treated[2]	32° F Untreated	40° F Treated	40° F Untreated	50° F Treated	50° F Untreated
Total soluble solids, pct.	10.69	10.58	10.64	10.64	10.69	10.59
Total acids, pct.	1.26	1.30	1.34	1.25	1.27	1.31
Solids to acid ratio	8.48:1	8.14:1	7.94:1	8.51:1	8.42:1	8.08:1
Ascorbic acid, mg./ml.	.30	.33	.34	.33	.33	.34

1 Average of 25 fruit.
2 Emulsions contained 10 per cent solids.

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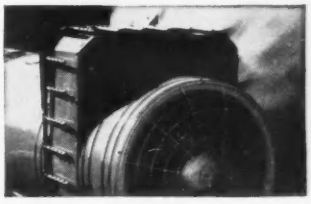

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Citrus Purchases of Selected Fruits And Juices By Regions and Retail Outlets, July-Sept. 1959...

By Clive E. Johnson
Market Development Research Division
Agricultural Marketing Service

The data in this report represents estimated purchases of specified fruits and juices by household consumers only. They do not include purchases by restaurants, hospitals, hotels, or other institutional outlets.

SUMMARY

Household consumers purchased substantially more frozen concentrated orange juice, shelf-pack orangeade, canned lemon puice, fresh oranges, and fresh grapefruit in the third quarter of 1959 than in the corresponding quarter of 1958. More moderate gains were reported for purchases of tomato juice and pineapple-grapefruit drink.

Chilled orange juice, and canned grapefruit juice were purchased in about the same volume as a year earlier.

On the other hand, third quarter buying of fresh lemons, canned grapefruit sections, single-strength orangeade, and prune juice was 5 to 12 percent below the same quarter a year earlier. Purchases of miscellaneous frozen concentrated juices, pineapple juice, and canned orange juice were 20 to 46 percent below July-September 1958.

The 1958-59 orange and grapefruit crops were greater than in the preceding season, when adverse weather led to the smallest production for several years. The lemon crop crop remained at the high level of the preceding season, but the prune crop was short. Greater quantities of citrus fruits were processed in 1958-59, and fewer lemons and Florida oranges were available for fresh use. Frozen concentrated orange juice was produced in record quantity, but there was a substantial decline in production of canned orange juice. Production of canned grapefruit juice and canned grapefruit sections increased over a year earlier.

In the 1958-59 season (October 1958-September 1959) purcahses of fresh citrus fruits and orange and grapefruit products for home use dropped below 1957-58 volumes. Frozen concentrated lemonade, single-strength lemon juice, and pineapple-grapefruit drink, however, were purchased at or near peak levels. Tomato juice made some gain over the preceding season, but moderate to heavy declines in household purchases were reported for prune juice, pineapple juice, and the miscellaneous frozen concentrated juices.

Household consumers spent a total of about $1 billion for selected fruits and juices in 1958-59, almost the same as in the preceding season. About $548 million were spent for fresh oranges and orange products, 2 percent less than in 1957-58. Expenditures for fresh and processed grapefruit, about $139 million, declined about 3 percent. Spending for lemons and lemon products, however, held steady at about $90 million. Expenditures for prune juice rose 10 percent over a year earlier and spending for pineapple-grapefruit drink increased 33 percent. There was a moderate decline from 1957-58 in expenditures for miscellaneous frozen concentrated juices.

Consumer expenditures for frozen concentrated orange juice in 1958-59 were about 14 percent greater than in 1954-55, when the orange crop was slightly larger. The gain, however, was about offset by a decline in expenditures for fresh orangse and canned single-strength orange juice. The 1958-59 grapefruit crop was about 4 percent larger than in 1954-55, but the amount spent for fresh grapefruit and for canned single-strength grapefruit juice was about 4 percent less.

Change in the Consumer Purchase Reports.—September 1959 completes a decade of financial cooperation between the Department of Agriculture and fruit industry groups in providing the data that appear in the consumer purchase reports. Beginning with October 1959, the Florida Citrus Commission, with some help from the California Prune Advisory Board, will pay the entire cost of obtaining the data.

The U. S. Department of Agriculture will continue to analyze the data and publish the reports as it has during the past 10 years. Purchase data for fresh lemons, lemon products, shelf-pack orangeade, and the detail for fresh oranges and grapefruit by area of production will not be obtained after September. On the other hand, information will be provided on purchases of canned fruit drinks other than orange and pineapple-grapefruit.

Only one report on purchases by regions and retail outlets will be made in the 1959-60 season. This report will be for January-March 1960. The family characteristics will be issued for April-September 1960.

CONCENTRATED JUICES AND ADES

Frozen orange concentrate. — Household consumers purchased about 13.6 million gallons of frozen concentrated orange juice in the third quarter of 1959. While this was a substantial gain over the abnormally small volume of the third

quarter a year earlier, the quantity bought was only about 84 percent of the average 1955-57 third quarter purchase.

Substantial gains were made over a year earlier in all regions except the Mountain-Southwest where there was little change. The decline from the 3-year average reflected a relatively small purchase in all regions and in all types of retail outlets. Per capita purchases averaged about 10.3 ounces nationally, or about 10 four-ounce servings of ready-to-drink orange juice.

Regionally, purchases amounted to about 6 ounces per person in the Southern and Mountain-Southwestern States, 10 in the North Central and Pacific Coast States, and 16 in the Northeast. Except for the disturbed period following the freezes in Florida, these were the lowest per capita purchases reported since the last quarter of 1953. Retail prices averaged 22.1 cents per 6-ounce can, compared with about 20.8 cents in the 2 preceding quarters and 24.6 cents a year earlier.

Production of frozen orange juice surged to a new high in 1958-59, 40 percent more than in the preceding season, and 11 percent more than in the previous high year of 1956-57. Retail purchases in the year ending with September, however, dropped about 5 percent from 1957-58 to 53 million gallons, the lowest since 1952-53.

At the average retail price of 22.1 cents per can, consumers spent about $249 million for frozen orange juice in 1958-59. This represented a gain of 5 percent over the amount spent in the preceding year and a 14-percent gain in the 5-year period beginning with 1954-55.

The average buying family purchased 10 ounces of frozen orange juice per week in 1958-59, at a cost of about 37 cents. While this was about the same size of purchase made in 1957-58, weekly expenditures averaged 3 cents higher. In 1954-55, buying family purchases averaged about 11 ounces per week and expenditures averaged 29 cents.

Shelf-pack orangeade.—The half-million gallons of shelf-pack concentrated orangeade bought for home use was the largest quarterly purchase reported since mid-1955. Buying increased substantially over a year earlier in the Pacific Coast States and moderately in the North Central area. Sales increased in independent and national chain stores. Retail prices, up slightly from a year earlier, averaged 18.7 cents per 6-ounce can.

Purchases of the product in the 1958-59 season totaled about 1.5 million gallons, the same as in 1957-58. Purchases in the North Central States (50 percent of the total) and the Mountain-Southwestern region failed to reach the year-earlier level, but moderate to large gains were made in other regions. Retail prices, at 19 cents per can, averaged 1.2 cents higher.

SINGLE-STRENGTH JUICES, ADES, AND DRINKS

Chilled orange juice.—Household purchases of chilled orange juice totaled about 5.4 million gallons in the third quarter of 1959, virtually the same as in the corresponding quarter of 1958. There were substantial changes from a year earlier, however, in the volume of purchases by region and type of outlet. Buying increased 17 to 28 percent in the Northeast, South, and Pacific States, but in the North Central States purchases dropped substantially and there was a fairly large decline in the Mountain-Southwestern region.

Sales fell off in independent and regional chain stores, with corresponding increases reported in national chains, and in "other retail outlets, such as dairies, delecatessens, etc., where about 50 percent of purchases were made. Retail prices edged up 1.4 cents from a year earlier to a new high of 42.6 cents per quart.

About 23.8 million gallons of chilled orange juice was bought in 1958-59, 6 percent less than in the 1957-58 season. Buying held steady in the Northeast, and heavy losses in the North Central, Southern, and Mountain-Southwestern States more than offset a substantial gain in the Pacific Coast States. At the average price of 41.8 cents per quart, consumers spent about $40 million for chilled orange juice in 1958-59, a little more than in the preceding year when prices averaged 38.5 cents.

Canned orange juice.—Retail purchases of canned single-strength orange juice were only about half as great as in the third quarter of 1958. Buying was down in all regions, with declines ranging from 31 percent in the South to 57 percent in the North Central States. The South accounted for about 35 percent of the total purchase volume, compared with a 28-percent share a year earlier. Retail prices were up 9 cents to a new peak of 45.6 cents per 46-ounce can.

Production of canned orange juice in 1958-59 was the smallest since the mid-1940's. Purchases for the season totaled about 9.3 million cases, 45 percent less than the relatively high volume of 1957-58, and 32 percent less than the 3-year average for 1954-55. Retail prices averaged 42.6 cents for the season, 9.6 cents more than in 1957-58.

Buying family purchases averaged about 21 ounces per week at a cost of 19 cents, compared with a purchase of 26 ounces and a cost of 18 cents per week in the preceding season. In total, consumers spent about $37 million for canned orange juice, 28 percent less than in 1957-58 and 18 percent less than in 1954-55.

Canned grapefruit juice. — Consumers purchased 2.2 million cases of single-strength grapefruit juice in the third quarter of 1959, the same as in the corresponding quarter a year earlier. On a regional basis, buying fell off moderately in the South and substantially in the Pacific Coast States, but fairly large gains were recorded in the North Central and Mountain-Southwestern regions. Purchases on a per capita basis averaged 5.5 ounces nationally, ranging from about 4 in the Pacific region to a little more than 6 in the Northeast. Consumer prices averaged 31.4 cents per 46-ounce can, about 2 cents less than a year earlier.

(Continued on page 32)

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Reports Of Our Field Men . . .

SOUTH POLK, HIGHLANDS, HARDEE AND DeSOTO COUNTIES

C. R. Wingfield
Phone: Glendale 3-4537
Avon Park, Fla.

The weather is playing tricks on us again and Spring has come in mid-winter. Temperatures have been in the 70s and 80s and while it is wonderful to enjoy it brings some problems. The citrus trees are just about ready to break out in a bloom and if February has frost and cold we could have damage to both next year's crop and new growth that is bound to come. Young trees have already started. It might be well to examine the non-bearing trees that have been banked for possible scalding and if found it may be well to remove some of the bank, at least on the south side of the tree.

Fruit is moving at a rapid rate and some think in two or three weeks the midseason fruit will be off the trees. The Valencias are maturing well and perhaps we can get into them early. The crop appears to be of a good quality at the present and we hope the prices will become some stronger as the harvesting progresses. There is some buying activity in the Valencia deal, put prices are not yet up to the price the grower expects.

SOUTH HILLSBOROUGH, MANATEE AND SARASOTA COUNTIES

Eaves Allison
P. O. Box 365, Sarasota, Fla.
Phone Fulton 8-2611

At the end of November the frosty hand of winter fell like the hammer of Thor. The beans and squash went and the tomatoes took a body blow which blackened about half the acreage in this area. The remaining fifty per cent lost most of its quality but not its price. Enough salvage operations went on to almost pull out of the hole.

That cold spell really put the citrus trees to sleep. Most groves, both young and old, became pretty well dormant. The temperature dropped into the low twenties but did not stay there very long. Some leaves were nipped where the trees were in a flush of new growth, but the lowest temperatures were of too short duration for heavy damage to result. The value of bringing our trees to early dormancy was vividly illustrated in this late November freeze.

HIGHLANDS AND POLK COUNTIES

R. E. Lassiter, Jr. & R. S. Carlin
P. O. Box 1304
Winter Haven, Fla.

Up until the time of this writing weather conditions have been mild in this area. Moisture conditions have remained good. We are already noticing growth and bloom in some blocks where fruit has been picked.

Growers will soon be concerning themselves with the Spring fertilizer application. This application should be well on its way by the first of February.

Due to the Manganese and Zinc patterns which have been noticed quite extensively during the past months, it would be well for growers to be on the look-out in their blocks for these patterns and plan on applying these materials in their Nutritional sprays this Spring.

Even though the insect populations have remained fairly low as of late, growers should continue to be on the look-out for mites and scale. It is expected that the Purple, Texas and Six-spotted Mite populations will be fairly low this Spring. The scale populations are generally light. Red scale activity is still evident in some blocks.

HILLSBOROUGH, PACO AND SUMTER COUNTIES

C. W. Dean
Gibsonton, Fla.
Phone Tampa 40-2592

I must certainly agree with everyone that the weather has been wonderful so far this winter. In fact, it might have been too wonderful in one respect. We have had good moisture and good warm weather which is certainly showing up in the citrus groves now. The trees are beginning to break with bloom which could be a disaster if they continue to come and I know of nothing but some good cold weather that will stop them. We should get the dormant spray on as quickly as possible to avoid damage to this bloom by rust mites, purple mites, etc.

As usual at this time, movement of citrus from the groves is in full swing with many boxes of fruit being picked.

NORTH CENTRAL FLORIDA

V. E. Bourland
Winter Garden, Fla.
Phone 107

We are having real spring weather now, and for about a week. Young trees are showing quite an amount of growth. Some older ones also, with bloom showing. Groves are looking good, and early and mid-season fruit is moving fast. Not going to be long until they will be gone. Valencias are looking good with size above the average. Tangerines are about gone. Grapefruit have been moving very satisfactorily.

WEST HILLSBOROUGH, PACO AND PINELLAS COUNTIES

J. W. Boulware
Phone WEbster 8-2638
Tampa, Fla.

Tree condition in general remains excellent in this area. We have had enough rain to carry the trees along nicely. A few trees have shown considerable leaf drop due to the following causes. Red mites (spiders) coupled with some dry and windy periods, have caused it. This can be taken care of in the spray program. Foot rot is quite prevalent, and where the bark is damaged, the food supply to that part of the tree is cut off and with dryer weather, we get leaf drop. Examine around the base of the tree for this, and if present, scrape off infected bark and treat with Bordeaux Paste and tree paint. Finally, root damage due to the past season of excessive wet weather, is causing some leaf drop.

For the growers that are on a three times, per year fertilization program, which is about 90% of our citrus acreage, now is the time for the Spring application. Also, now is the time to plan your spray program, if not already done.

Consumer Purchases of Selected Fruits and Juices, by Regions and Retail Outlets, July-Sept. 1959

(Continued from page 29)

In the 1958-59 season household consumers purchased 8.9 million cases of grapefruit juice, a decline of 15 percent from the preceding season, and 21 percent from 2 years earlier. Production of the product, however, was moderately greater than the low 1957-58 volume. Retail prices rose 2.8 cents to 32.3 cents per can, the highest reported for any season since 1949-50. Consumers spent about $27 million for this juice in 1958-59, 7 or 8 percent less than in either of the 2 preceding years. Buying family purchases averaged 23 ounces per week in 1958-59, and expenditures averaged 16 cents.

Canned juices. — Third quarter purchases of the 6 individually reported canned single-strength juices amounted to about 14.6 million cases, 15 percent less than in the same quarter a year earlier. Purchases for the 1958-59 season totaled about 62.8 million cases and the total household consumer expenditure was $211 million. This was a drop of 16 percent in purchases and 8 percent in the amount spent in comparison with 1957-58.

FRESH AND CANNED FRUIT

Fresh oranges.—About 3.1 million boxes of fresh oranges were bought for home use during July-September 1959, a third more than the unusually small volume purchased in the third quarter of 1958. Substantially heavier purchases were made in all regions and in all types of retail outlets. Per capita purchases varied from about 1.7 oranges in the South to a little more than 6 in the Northeast, averaging 4 oranges per person nationally. Retailers charged an average of 52.7 cents for a dozen oranges, 11.3 cents less than a year earlier.

Purchases of California-Arizona oranges, with substantial gains in all regions except the Mountain-Southwestern, were up 36 percent from the third quarter of 1958 to 2.4 million boxes. These oranges bought an average of 53.1 cents per dozen, 12.9 cents less than a year earlier. Purchases of Florida oranges totaled about 240,000 boxes, the same as a year earlier, but prices charged were down about 10 cents to 49.2 cents per dozen. Consumers were not able to identify the area of origin of most of the other oranges purchased during the quarter. Prices paid for such fruit dropped 4.6 cents from a year earlier to 53.1 cents per dozen.

In the season ending with September, retail purchases of oranges totaled about 22.3 million boxes, slightly less than in 1957-58, and well below levels of earlier years. Purchases in the Northeastern and North Central States, about two-thirds of the total, held at about the 1957-58 level. A good improvement was reported in the Pacific region in contrast to substantially lighter buying in Southern and Mountain-Southwestern States. Per capita purchases for the year ranged from 18 or 20 oranges in the South and Mountain-Southwestern regions to 38 in the Northeast, averaging 29 oranges per person nationally.

In 1954-55, when the crop was slightly larger and fewer were processed than in the current season, purchases averaged 42.3 oranges per person. The average buying family purchased 6 oranges per week in 1958-59 at a cost of about 24 cents. This was a slightly larger purchase but a slightly smaller expenditure than was made in 1957-58.

Consumer expenditures amounted to about $200 million for the season, 4 percent less than in 1957-58, and 11 percent less than in 1954-55. Expenditures for California-Arizona oranges in 1958-59, about $116 million, were up about 4 percent from a year earlier, but the amount spent for Florida oranges dropped about 20 percent to $47 million.

Fresh grapefruit.—A million boxes of fresh grapefruit were bought for home use in the third quarter of 1959. This was about twice the quantity purchased in the same quarter a year earlier, when buying was the lowest reported in the 10-year series. The gain in volume was confined almost entirely to the Northeastern, North Central, and Southern regions. Grapefruit were retailed at an average price of $1.16 per dozen, 24 cents less than a year earlier.

Purchases of California-Arizona grapefruit, about 312,000 boxes, were up a third from a year earlier. Prices charged for these fruit dropped 22 cents to $1.19 per dozen. The 358,000 boxes of Florida grapefruit purchased was about 5 times the July-September 1958 volume. At $1.10 per dozen, Florida grapefruit were about 34 cents cheaper than a year earlier. Purchases of unidentified grapefruit also increased substantially. Prices for such fruit at $1.19 per dozen, were down about 20 cents.

During the 1958-59 season, householders bought about 16 million boxes of fresh grapefruit, about the same as in the preceding season. Purchases of Florida grapefruit, about 54 percent of the total, were up moderately, but declines of 9 to 12 percent were reported in purchases of grapefruit from other areas. The Northeast and the North Central regions each accounted for about a third of total purchases, the South and the Pacific States for about 12 percent each, and the balance was bought in Mountain-Southwestern States.

Canned grapefruit sections — July-September purchases of canned grapefruit sections rose substantially over the low levels that prevailed in the two preceding quarters, but even so, purchases were down 5 percent from the third quarter of 1958. Buying increased in the Pacific Coast States, but declines of up to 30 percent occurred in other regions. Purchases averaged 1 ounce or less per capita in the South and Mountain-Southwestern States, compared with more than 3 ounces per person elsewhere. The average retail price of 20.6 cents per No. 303 can was a little higher than a year earlier.

The total 1958-59 purchases of about 3.3 million cases was only about 90 percent of the quantity purchased in 1957-58. Regionally, purchases were up about 8 percent in the North Central States, but slight to heavy reductions were reported for other areas. About 36 percent of total purchases were made in the North Central States, compared with a 30-percent share in the preceding season; in the Northeast, the proportion of total declined from 40 to 37 percent.

On the average, a buying family purchased a little more than 13 ounces of grapefruit sections per week in 1958-59 at a cost of about 17 cents. The size of purchase in the preceding season also averaged about 13 ounces, but the cost was about 16 cents. Consumer expenditures totaled about $20 million in 1958-59, moderately less than a year earlier.

During the 1958-59 season the members of the Florida Canners Association used 18,419,150 boxes of grapefruit, which amounted to 52 percent of all grapefruit grown in the State of Florida.

PRESIDENT OF MT. DORA CO-OP DIES AT HIS HOME

Mr. Willard Wadsworth, president of Mount Dora Growers Cooperative for the past fifteen years, died Monday at his home on Lake Beauclair near Mount Dora. He was 78, and had been active in citrus affairs in Florida since 1913.

At the time of his death, Mr. Wadsworth was the 12th oldest living member of the New York Stock Exchange. He actively directed board activities of the Mount Dora cooperative until his death.

The Florida Citrus Exchange paid tribute to the deceased citrus man this week, calling his service to that organization "outstanding" during the 50 year development of the cooperative sales agency.

C. G. Hurlburt, manager of Mount Dora Growers Cooperative, said that the progress of the firm had been greatly enhanced by the membership of Mr. Wadsworth.

"His experience and successful business career has been most valuable to us in many ways. His influence has been reflected in much of the progress of the firm and will be felt for years to come," Hurlburt said.

Mr. Wadsworth was a native of Plainfield, New Jersey, although he had been a regular Florida wintertime visitor for the greatest part of his business career. His body was returned to Plainfield for burial.

LAST LINE

Several farmers idling away a rainy day at the crossroads filling station got to arguing the merits of various church denominations. All expressed opinions except one old gray-beard who sat quietly whittling but listening attentively.

Finally, someone asked, "What do you think, Grandpa?"

"I'm thinkin'," replied the old man, "that there are three ways from here to the cotton gin. But when you get there, the ginner ain't goin' to ask which way you took. He's goin' to ask, 'How good is your cotton?'"

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Hamlin, valencia, pineapple and temple oranges; orlando and mineola tangelos for spring or summer planting. Nemotode free. Prices on request. Crescent Farms, P. O. Box 890, Bradenton, Florida. Telephone 2-3821 or 2-7004.

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approved for use on bearing citrus trees

Gives outstanding control of Citrus Red Mites, Six-Spotted Mites and Texas Citrus Mites

Here is good news for citrus growers! Tedion, the miticide that has time after time proved to be the outstanding control for citrus red mites, six-spotted mites and Texas citrus mites, is now approved for use on bearing trees. You can apply Tedion to oranges, grapefruit, tangerines, tangelos, limes, and citrus citron while fruit is on the tree. Tedion can also be used on lemon trees, but only while no fruit is present.

Now—Apply Any Time During Season

The new approval for Tedion on Citrus means that you now have available a superior miticide that can be applied at any time during the fruiting season. Use only one application after fruit begins to form. On non bearing trees there is no restriction.

Most Effective Miticide Available

Several years of testing have shown that Tedion is the most effective miticide available for several reasons:

- **Long Lasting Control** – Tedion is extremely long-lasting in its effectiveness as a mite control. Repeated sprays are not necessary. You get better fruit production; greater economy in growing your crop.

- **Low Toxicity** – Tedion has a very low order of toxicity—it is safe to the spray-operator and grove workers, and non toxic to fruit and foliage. Tedion lets your trees grow properly without spray damage.

- **Harmless to Beneficial Insects** – Tedion is non harmful to bees and other beneficial insects—it kills *only* mites.

Technical Chemicals Department,
Niagara Chemical Division,
Food Machinery and Chemical Corp.
Middleport, N. Y.

Tedion

Tedion is available from CALIFORNIA SPRAY CHEMICAL CORPORATION • GENERAL CHEMICAL DIVISION • NIAGARA CHEMICAL DIVISION • STAUFFER CHEMICAL COMPANY and their dealers.

We Invite Comparison...

. . . . It has been the unvarying policy of this company from the first day of its existence to constantly seek to manufacture the finest fertilizers it is possible to produce . . . no expense has been spared to bring about the realization of this objective . . . and as a result only the very finest proven ingredients, and the most modern methods of manufacturing are always characteristic of our fertilizers.

. . . . We make this statement with no desire to belittle the products of other manufacturers, but simply to present the facts to those who grow Florida's fine citrus and vegetable crops.

. . . . Many of the state's most successful growers have been using our fertilizers constantly throughout the years and have demonstrated for themselves the truth of our claims for producing fine fertilizers which result in their fine crops.

. . . . So we invite comparison, and suggest if you are not already a user of Lyons fertilizers, that you set aside a plot, either large or small, in your grove or field and use our fertilizers exclusively in such a test plot . . . and let the results govern your future purchases.

. . . . When you figure the cost of your fertilizers, we recommend that you base any comparison upon the basis of your per box cost of fertilizers, rather than upon your total fertilizer expense.

You will also find our Field Service Men highly competent to advise with you on your production problems . . . and always willing to serve you.

LYONS FERTILIZERS Produce MAXIMUM CROPS Of FINEST QUALITY

Lyons Fertilizer Company

Phone 43-101

TAMPA FLORIDA